VOL. II. MARCH, 1891.

25.6.

AGRICULTURAL GAZETTE OF NEW SOUTH WALES.

INVENTARIO DE LA BIBLIOTECA NACIONAL DE MADRID 1940

SYDNEY: GEORGE STEPHEN CHAPMAN, ACTING GOVE

11-28—91 [1s. for a Single Number or 10s. per Annu

Ayuntamiento de Madrid

THE AGRICULTURAL GAZETTE

OF

NEW SOUTH WALES,

ISSUED BY DIRECTION OF

THE HON. SYDNEY SMITH, M.P.,
SECRETARY FOR MINES AND AGRICULTURE.

H. C. L. ANDERSON, DIRECTOR.

VOL. II. PART 3.

MARCH, 1891.

By Authority:
SYDNEY: GEORGE STEPHEN CHAPMAN, ACTING GOVERNMENT PRINTER.
1891.
[1s. for a Single Number, or 10s. per Annum.]
11b 28—91

Ayuntamiento de Madrid

CONTENTS.

Ayuntamiento de Madrid

New Commercial Crops for N.S.W.

(*Continued from Vol.* II, *page* 4.)

By FRED. TURNER, F.R.H.S.

The "Opium Poppy" (*Papaver somniferum*, Linn.): Its Medicinal Properties and Products.

Various species of the genus Papaver yield more or less opium, but the commercial article is the produce of a plant known to botanists as *Papaver somniferum*, Linn. It is an annual plant, growing from 3 to 4 feet high, with stem clasping, glaucous, broad waved leaves, and variously-coloured flowers, ranging from white to violet. The opium poppy is supposed to be a native of the Levant, but it is now to be found growing in most of the semi-tropical and temperate parts of the earth, either cultivated as a commercial product, or as an ornamental plant in gardens. There are two well-marked varieties (and from these again there are numerous variations, differing principally in the colour of their flowers) of the plant, one with dark, and the other with light-coloured seeds. Their qualities, however, are much the same.

Preference is usually given to the Smyrna variety, as it is considered to give a greater yield and a superior quality of opium. Both of these varieties grow equally well in the coastal districts of this continent, and very good samples of opium have been prepared at the Botanic Gardens in Brisbane and Melbourne, which were said by experts to be equal to any produced in any part of the world. Opium is derived from the Greek *opion* (juice), and it is one of the most valuable medicines known. It is said that no less than fourteen alkaloids have been detected in opium. Its chief value depends on the morphia it contains, and it is somewhat remarkable that the various species of the genus *Papaver* are the only known source from which that drug can be obtained. The nearly-ripe poppy capsules, when dried and deprived of their seeds, are of commercial value also. Besides the value of this plant from a medicinal point of view, it has another important economic use. From the numerous small seeds which the capsules contain, a light, golden-coloured oil is expressed, which is used for a great variety of purposes. Olive oil is said to be adulterated with it, an admixture of little consequence so far as health is concerned, as the poppy oil is destitute of any narcotic properties. The seeds yield about 50 per cent. of their weight in oil, and for this article alone it would pay to cultivate the plant in this Colony. It is said on very good authority that the value of poppy seed produced annually in France is upwards of £200,000. The seed is often sold for birds' food in Europe under the name of "Maw seed." Unfortunately I cannot give any information

Ayuntamiento de Madrid

to our farmers about the amount of poppy oil or its value that is imported into the Colony, because it does not appear as a separate article in the Statistical Register. According to that authority, however, the importation of opium into the Colony for the year 1889, amounted to 25,256 lb., valued at £47,915, and the exports to 5,068 lb., valued at £10,734, thus leaving the value of the home consumption at £37,181. It would take the produce of about 450 acres to supply the annual demands for opium alone in this Colony. An acre of well cultivated poppy plants would yield from 40,000 to 50,000 capsules, and these will exude under proper treatment from 40 lb. to 50 lb. or even more, of opium, the usual market value of which is from 30s. to 35s. per lb. Farmers in this Colony are now cultivating crops which give them smaller returns, and they might do much worse than put under cultivation an acre or two of the opium poppy. It is only by attending to these "small cultures" that farmers can ever hope to make their calling a more lucrative one. Many of these crops can be harvested at slack times, whilst the ordinary crops are maturing. The poppy plant occupies the land but for a few months of the year—usually about 3½—so that the produce can soon be turned into a marketable commodity.

Site for an opium poppy field.—This should be situated in a humid valley if possible, well sheltered from high winds. The plant is very brittle during all stages of its growth and, therefore, easily damaged, so that unless it can be well protected against prevailing winds, I would not recommend its cultivation.

Soil.—The soil that is best suited to the growth of the opium poppy is an easily worked rather loose, rich, black loam, and this can be found in many places in the coastal districts of this Colony. Generally speaking good maize land will produce excellent crops of the opium poppy. The land should be brought to a fine tilt, by ploughing and cross ploughing, and harrowing, so that the young plant, which is very delicate during the early stages of its growth, will have no difficulty in coming up through the soil, or its tender roots in penetrating the earth. Unless the land is well prepared the young plants will come up patchy, and they will have a great struggle during the early stages of growth, which, of course, would materially influence their productiveness later on.

Sowing the seed.—The seed should be sown in May in the north-eastern district, and in June in the southern districts; but where late frosts hang about the sowing had better be deferred till August. The usual way is to sow the seed broadcast, but I have found, by experience, the drilling in system (but very shallow) is the best when the plant is grown for opium. The drills should be 18 inches apart for the following reasons:—1st. The thinning out of the plants is more expeditiously done, 2nd. The field is more easily kept clean of weeds; and 3rd. It facilitates the collecting of the opium without injury to the plants which inevitably occurs where the crop is sown broadcast. Of course, if the poppy is grown for its seeds alone, then it may be sown broadcast, because it is only necessary to go over the field once to thin out and clean the plants, and at most twice, to collect the ripe capsules. Nine pounds weight of seed are sufficient to sow an acre. Previous to sowing, the seed should be mixed with three times its quantity of fine soil which will ensure it being more evenly sown, after the seed has been sown broadcast a pair of very light fine toothed seed harrows should be put over the ground in the contrary direction to which it was sown to cover the seed. But a bush harrow will be all that is necessary after the drill, provided that the seed has not been sufficiently covered. This kind of harrow should be put over the ground in the same direction as the seed was drilled in.

Ayuntamiento de Madrid

Thinning out the Plants.—Under favourable circumstances, the plants will be above ground in about ten days, and when they are 2 inches high, they should be carefully thinned out and weeded, this is easily done by a light draw-hoe. The plants should be left from 9 inches to 1 foot apart in the rows, which will allow them plenty of room for their proper development, and their foliage will shade the ground, which will not only be advantageous in preventing evaporation of moisture from the soil, but the growth of weeds will be prevented. The only operation now necessary will be an occasional hoeing between the rows to keep the soil loose, so that the plants may get the benefit of any rains which may fall until October, November, and December, or perhaps earlier according to circumstances, when they will be ready for having their produce collected from them.

The following extracts are from two or three sources, but principally from Dr. Pereira's "Materia Medica," on collecting and preparing the drug as a commercial product in India. "The preparation of the drug seems to be conducted in much the same way in the various districts whence opium is obtained, but in some much greater care is taken than in others. In India a very large extent of country is devoted to the cultivation of the opium poppy, and at Behar and Benares are Government agencies established for the purpose of regulating the manufacture, insuring the purity of the drug &c. When the flowers are in bloom the first step is the removal of the petals which are used in packing the prepared drug. After a few days the imperfectly ripened capsules are scarified from above downwards by two or three knives tied together and called nushturs. These make a superficial incision, or series of incisions, into the capsule, whereupon a milky juice exudes, which is allowed to harden and is then removed and collected in earthen pots. The time of day chosen for slicing the capsules is about 3 o'clock in the afternoon when the heat of the sun causes the speedy formation of a film over the exuded juice, great attention is also paid to the weather, prevailing winds, dew, &c., as all these causes modify the quantity, quality, or speediness of exudation of the opium. The capsules are submitted to two or three slicing processes at intervals of a few days, and the drug is ultimately conveyed to the Government factory, where it is kneaded into a homogeneous mass by native workmen. It is analysed by native examiners, whose tact and experience are such that the results of their examination differ but very slightly from those afforded by the more scientific investigation of the European Officers. In this manner the quality of the drug is ascertained, its freedom from adulteration insured, and its strength reduced as nearly as may be to a uniform standard. When thus prepared, the drug is in a fit state for exportation, and it is then, by means of earthen cups, moulded into spherical masses of the size of a childs head, closely invested on the outside by the dried petals of the flower, compacted together by pressure and by immersion into the gummy fluid residue which drains off from the more solid opium during its preparation. It is remarkable that the natives and Government Officials, who thus are exposed to the fumes of this drug for several hours daily, and this at a temperature of 90° to 100° and upwards, are seldom injuriously affected. Some of the operators are literally immersed in opium for several hours daily, so far as regards their legs and arms, and yet slight drowsiness at the end of the day is the sole inconvenience ever experienced, and this by no means frequently."

When the poppy plant is grown for the seed alone it is not absolutely necessary to thin out the seedlings, although they will develop into much finer plants if this is done. The thinning out of the young plants is more expeditiously done with a light draw-hoe when the seedlings are about 2

Ayuntamiento de Madrid

inches high, and any weeds that may be present will be easily destroyed during the operation. The plants may be left to grow about 9 inches apart. Under ordinary circumstances the crop will require no further attention until it is ready for harvesting which will be in about four and a half months after the seed is sown, The capsules should not be allowed to get too ripe before they are gathered, otherwise some of the seed might be lost in the operation. To harvest the seed in a sufficiently good condition, it will be necessary to go over the plants twice to collect the capsules, for it will be found that they will not all ripen at the same time; and to collect the half ripened with the ripened seed, would only cause them to ferment when heaped together. If fermentation did take place it would damage the produce materially, and of course render it of less commercial value. When the proper time arrives for harvesting the crop, the capsules are best collected in bags made of light, but very fine material, so as not to allow of the very fine seed being lost. Straps should be fixed to the bags long enough to pass over the shoulder of the collecter. As each bag is filled it should be emptied on to a large sail cloth spread in the sun, so that the capsules can be thoroughly dried before the seeds are threshed out Whilst the capsules are drying they should be protected against dews and rains, and be turned over occasionally on the cloth. This will empty them of a quantity of seed which should be separated from them. What seed remains in the capsules should be threshed out, and put through very fine sieves to clean it of husks, &c., when it is ready to have the oil expressed from it. An acre of well cultivated poppy plants will yield about half a ton of seed, and from this can be expressed about 560 lb. weight of oil. The residue makes very good feed for cattle. The oil is inodorous, and of an agreeable flavour, so that it can be used for domestic purposes, such as salads. Besides this it can be used for a great variety of purposes, and is extensively used in house-painting. Mixed with white lead it leaves a beautiful surface, which does not afterwards change by the action of light into a dirty yellow colour. After the crop is gathered cattle and sheep may be turned into the field to eat the stalks down. Although they may not be considered very fattening, still the sheep will eat them, without any ill effects.

Ayuntamiento de Madrid

The India-rubber Tree.

By FRED TURNER, F.R.H.S.

Consequent on certain inquiries by the American Consul, Mr. G. W. Griffin, regarding the growth of the India-rubber tree in Australia, Mr. Jas. Harold, Agricultural Editor of the *Town and Country Journal*, who was approached by Mr. Griffin on the subject, arranged an appointment between the Consul and myself at which he also was present. At that meeting it transpired that Mr. Griffin had been making the inquiries, at the request of the Department of Agriculture at Washington, U.S.A., with a view to preventing a failure in the supply of this product. The questions asked by Mr. Griffin on behalf of his Government, together with the information which the Department of Agriculture was enabled to supply in reply to them, are appended:—

Question (1.) Have any experiments been made in the cultivation of rubber trees, plants, or vines, in Australia; if so, recount the successes or failures?

Answer: Experiments have been made both on indigenous and exotic trees. A species of fig (*Ficus macrophylla* Desf.) which is closely allied to the "Assam Rubber" tree of India (*Ficus elastica*, Rox.) yields a very fair Caoutchouc, and parties were collecting the sap at a place called Coomera, in Southern Queensland, a few years ago. This tree is found growing abundantly in New South Wales and Queensland. It is easily propagated by seed. Another species of fig (*Ficus rubiginosa*, Desf.) which is also indigenous to New South Wales and Queensland, yields a caoutchouc, and it formed the subject of the following chemical investigation by Warren de la Rue, and Hugh Miller, in Watt's Dict. II. 646,—"The resinous exudation of this tree resembles euphorbium in appearance, varies in colour from dirty yellow or red to almost white, solid, generally brittle, but tough in the interior of large pieces, opaque, with dull and wax-like fracture; at 30° C it softens and becomes plastic like gutta-percha, but not so sticky, provided it has been previously wetted in water. In its natural state it has neither taste nor odour, but evolves an odour like that of wax when heated, and evinces a characteristic taste on being masticated. It is quite insoluble in water, either hot or cold. The greater part of it is soluble in cold alcohol, and a considerable portion of the remainder in hot alcohol, and by treating it with these solvents in succession, it may be separated into the following constituents:—

Resinous substance, *sycoretin*, easily soluble in cold alcohol	73
White crystalline substances, chiefly acetate of *sycoceryl*, C_2H_3O, $C_9H_{29}O$, insoluble in cold, but soluble in warm alcohol	14
Caoutchouc, fragments of bark, sand, and loss	13

Ayuntamiento de Madrid

Mr. W. Hill, late Colonial Botanist of Queensland, when giving evidence before a Select Committee of the Legislative Assembly, on Forest Conservancy, said in answer to a question put by the Chairman (Hon. John Douglass), "Is there any probability of a good india-rubber tree being discovered on our northern coast?"

Answer: "I have not the least doubt that some of the fig trees on the Daintree and Johnstone Rivers will produce a good deal of india-rubber."

In a report which the Colonial Botanist furnished to the same Committee on the Forest resources of Queensland, he says, "The fig tree reserves in the north would make excellent places for the acclimatisation of such plants as the bottle india-rubber tree (*Siphonia elastica*), and the gutta-percha plant (*Isonandra gutta*), as I am convinced they would flourish admirably there."

The exotic india-rubber yielding trees and vines that are at present growing in Australia are:—

The Assam rubber tree (*Ficus elastica*, Rox.), grows rapidly in the coastal districts of New South Wales and Queensland, and is easily propagated by seeds and cuttings.

The Ceara rubber tree (*Manihot-glazioni*, Muell.), was introduced and produced flowers in the Botanic Gardens, Brisbane, as far back as 1867. Good samples of rubber have been taken from this tree, and exhibited, amongst other economic products that were prepared at the Botanic Gardens, Brisbane, at the Intercolonial Exhibitions. The last time that I saw this tree it was about 25 feet high, and as it will thrive on dry, poor soils, it is one of the most valuable india-rubber producing trees that has been introduced into Australia.

The West Indian rubber plant (*Castilloa elastica*, Cerv.) has been introduced and propagated, but the tree has not been long enough in the country to know what district is suited to its growth.

The india-rubber vine (*Cryptostegia grandiflora*, R. Br.) grows exceedingly well in southern Queensland, and produces both flowers and seeds; from the latter it is easily propagated.

The Para rubber tree (*Hevea Braziliensis*, Muell.) has also been introduced and propagated, but the tree has not been long enough in the country to know what district it will flourish in, that is, the most southern limit.

The African rubber vine (*Landolphia florida*, Benth.) is also growing in Australia, but it has not been long enough in the country to know what district it will flourish in.

Question (2): Is it believed that rubber is susceptible of cultivation, or that its culture would be profitable?

Answer: By the foregoing evidence, which is the most reliable that can be obtained, I should think that the systematic cultivation of rubber-producing trees in suitable localities would be a payable undertaking. It should be borne in mind that caoutchouc cannot be obtained from trees all the year round, only at stated periods, to make it a success as a commercial undertaking. Very many other commercial crops, however, could be grown in the vicinity of the india-rubber tree reserves, and harvested at times when the rubber was not in a fit state to collect, which would make the undertaking a more profitable one.

Ayuntamiento de Madrid

Notes on Economic Plants.

Seed and Seedlings of the Sugar-cane.

The June (1890) number of the Journal of the Royal Agricultural and Commercial Society of British Guiana contains the following interesting information "on the actual proof and general recognition of the fact that the sugar-cane produces fertile seed—a result brought about by the work of Mr. J. B. Harrison, M.A. (late Professor of Chemistry in Barbados, and now Government Chemist of British Guiana), and Mr. Bovell, of Barbados."

More than two years ago these two gentlemen were, by their experiments, led to the opinion previously stated by other observers, that the sugar-cane not only produces seed, but *fertile* seed; and it is now eighteen months since the results of their experiments, which had been carried out on a scale, and in a manner, that placed the fact beyond doubt, were made known. Since then, confirmatory of their work, the seeds have been sown by other individuals and have germinated, and the seedlings have been planted out and raised.

Spikelets of fertile seeds, and germinating seeds and seedlings, preserved in glycerine were distributed by the investigators, and some of the seedlings have so far advanced, that an analysis has been made of one of them.

Among other individuals, and by special request, Mr. D. Morris, of Kew Gardens, was supplied with spikelets containing fertile seeds, and germinating seeds, preserved in glycerine. These, or corresponding examples, raised by him from the seed supplied were figured and exhibited by him at the March meeting of the Linnean Society. From this fact, it seems that the discovery of cane seed has been wrongly ascribed by some journals and papers to Dr. Morris. Contemporaneously and independently, the late Dr. Soltwedel appears to have attained the same results in Java, that Messrs. Harrison and Bovell did in Barbados. The special credit is, however, due to the two latter gentlemen, that it was through their work that the matter is now regarded as definitely settled, and general recognition given to the fact that the sugar-cane produces fertile seed.

The Chayote, or Choco (*Sechium edule*, Swartz).

Mr. W. Hill, of Eight-mile Plains, near Brisbane, has very kindly presented to the Department fifty specimens of the fruit of the chayote, and these have been distributed for cultivation in the north-eastern portion of the Colony.

To each recipient of a fruit the following note, by the Departmental Botanist (Mr. F. Turner), was sent, giving directions as to the proper mode

Ayuntamiento de Madrid

of cultivation:—"The choco belongs to the cucumber tribe of plants, and the soil should be prepared for it in a somewhat similar manner as for those plants. Put the seed about 2 inches below the surface of the soil, and in very dry weather give them water occasionally until the plants are established, when they will take care of themselves. The stems grow very long, and should be trained over an arbor or a fence; about twelve months after planting they will bear fruit. In the West Indies the fruit is reckoned extremely wholesome, and it is commonly used as an article of food by all classes. Besides its utility as a food for man, it has the reputation of being a very fattening food for hogs and other animals. The large fleshy roots, which sometimes weigh as much as 20 lb., are also edible when cooked. During the winter the stems will often die down, but new ones will spring up on the return of warm weather.

The Teak tree (*Tectona grandis*, Linn.)

A quantity of fresh seeds of this tree has been received from the Curator, Botanic Gardens, Rockhampton. It is intended to distribute these among those residents of the Richmond or Tweed River districts, who are desirous of cultivating them for sake of the tree's valuable timber, which is of great strength and durability, shrinks very little, is easily worked, and is not liable to be attacked by fungi. The botanist who has grown this tree in Southern Queensland considers that the north-eastern part of this Colony is admirably suited to its growth.

The Carob tree (*Ceratonia siliqua*, Linn.)

A quantity of beans of this tree has also been received from Rockhampton. It will grow over the greater portion of the Colony, but will succeed best on lime-stone formations. The beans of this tree contain about 66 per cent. of sugar and gum, and furnish valuable food for stock of all kinds.

Custard Apple (*Anona squamosa*, Linn.)

Mr. R. Rietschel, of Meran Creek, wrote to the department, on 10th February, to the following effect, regarding this plant:—"With *Anona Squamosa* I am sorry to say I had no luck; after a nice start they were eaten down one night by some insect, although, I always protected the seedlings; neither could I detect the insect doing the damage."

Slugs are very fond of the young seedlings and might easily eat them down in a night. A little soot or lime placed in a circle round each plant, but some distance off it, has been found very effective in checking the ravages of these destructive pests.

Thousand-headed Kale: Jersey tree Kale.

Mr. Frank D. Morrah, of Nanimo, Wellington, New South Wales, has forwarded his report on the experimental growing of these plants, and states that both kinds have done well and are invaluable to the dairy farmer. He is of opinion that they would thrive best in a deep black soil, but if the more tenacious red soils were cultivated to a sufficient depth to allow of the roots getting well down there was no doubt that either plant would thrive and also be found to resist dry weather.

Ayuntamiento de Madrid

Bokhara Clover (*Melilotus leucantha*, W.)

According to a report received from Mr. Frank D. Morrah, of Wellington, N.S.W., to whom seeds of Bokhara clover were supplied by the Department for experimental purposes, the seed did not germinate very freely. Those which did germinate have stood very fairly, and he is of opinion that, if cultivated, it would be found a useful plant and likely to withstand dry weather very successfully. He thinks it would probably thrive best on alluvial flats.

The Sunn Hemp Plant (*Crotalaria juncea*, Linn.)

One satisfactory result at least has followed from the distribution of seeds of the Sunn hemp plant. Mr. E. F. Rudder, of Coramba, South Grafton, one of the recipients, forwarded, in January last, a plant to the Department, the seed of which was sown on the 8th of the previous November. The plant showed remarkable growth for the period since the seed was sown, and tends to prove how well it is suited to the climate of that portion of the Colony. The approved method of treating the Sunn hemp to obtain the fibre is as follows:—If a superior soft fibre is desired, the plant is pulled while in flower; if strength of fibre is the object, the plant is left standing until it has almost ripened its seeds. After the stems are pulled they should be tied into convenient sized bundles and taken to the river, pond, or tank, to ret. The bundles should be laid parallel to each other in the water, and weighted down with pieces of hardwood. When the bundles have been in the water for three days one of them should be tested; if the fibre separates easily all the bundles should be taken out of the water and untied. Each stem should then be taken in the left hand, and, with the right hand, the fibre stripped off the woody part. This fibre should then be well washed in water to rid it of all gummy matter, and hung on lines to dry in the sun. After the fibre is thoroughly sun-dried it should be made into conveniently sized hanks and packed into bales, when it is ready for market.

Panicum colonum (Linn.)

A specimen of grass forwarded to the Department by Mr. Thomas Clyburn, of Canowindra, and which, he says, is in appearance something like millet, has been identified by the Botanist as *Panicum colonum*. This is a grass which has been introduced into the Colony; it is common in the tropical and sub-tropical regions of the Old World, and in many parts of America. It is an annual species, growing from 2 to 8 feet high. On moist land this strong grass yields an enormous amount of rich succulent herbage, which is greatly relished by stock of all kinds. It is especially valuable for milch cows, and from its great bulk should make good ensilage. There would be no difficulty in bringing it under systematic cultivation, as it produces a large quantity of seed, which is easily collected. To obtain the best results the seed should be sown in October, in fairly rich moist land.

Ayuntamiento de Madrid

The Grasses of New South Wales.

(*Continued from Vol.* II, *page* 22.)

By F. TURNER, F.R.H.S.
Botanist to the Department of Agriculture, New South Wales.

AGROPYRUM SCABRUM, *Beauv.* "Wheat grass."

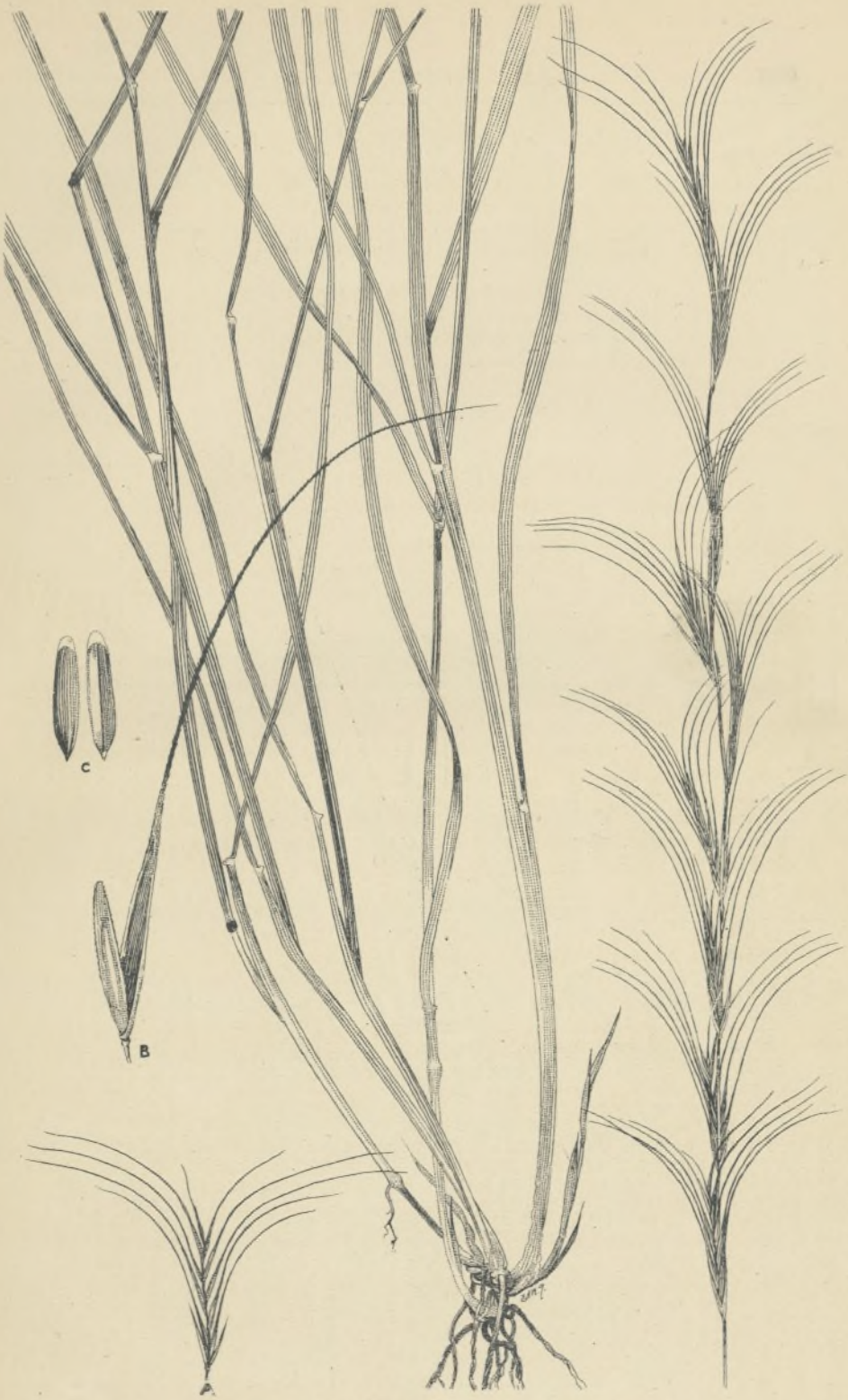
Flora Austr., Vol. VII, p. 665.

Very variable as to stature, sometimes under 1 foot high, slender, with short filiform leaves, and from that to 3 or 4 feet, with narrow spreading flat or convolute leaves. Spike usually 6 inches to 1 foot long, the rhachis scarcely notched. Spikelets distant, sessile, erect, $\frac{3}{4}$ to 1 inch long without the awns, narrow, 6 to 20-flowered; in the small specimens sometimes only one or two spikelets. Glumes narrow, rigid, straw-coloured, mostly about 5-nerved, not distinctly keeled, the two outer empty ones rather shorter, tapering into short points, the flowering ones 4 to 6 lines long without the awns, tapering into fine straight, or at length spreading awns mostly longer than the glumes, and sometimes above 1 inch long, those of the upper and of the lower glumes often not so long as the intermediate ones. Palea obtuse.

This variable grass as regards stature is found growing over a greater portion of the Colony, and in some places it is very abundant. Henry Dawson, Esq., M.L.A., brought me some specimens, which he collected near Cooma, that were nearly 5 feet high. During the winter and early spring months, ere many of our native grasses begin to grow, it yields a rich succulent herbage, which stock of all kinds are fond of. When it becomes old, however, it is rather harsh, and in that state stock will seldom touch it whilst other feed is plentiful. If cut when it first shows its flower stems it can be made into excellent hay. I have had this grass under cultivation, and it was much superior to that ordinarily seen in pastures, both in bulk and quality. I can recommend its cultivation, either for early spring feed or for making into hay. When the seeds are ripe its seed awns are often troublesome, causing irritation to lambs by getting into their eyes and wool, but never to the extent that the seed awns of the genus *Stipa* and *Aristida* do. When left unmolested for a time this grass will produce a fair amount of seed, which ripens during September, October, and November. There is a variety (var. *Breviseta*) of this grass with much shorter seed awns; with this exception, however, its qualities are much the same.

Reference to plate.—A, Spikelet. B, Floret. C, Grain, back and front views. All variously magnified.

Ayuntamiento de Madrid



Agropyrum scabrum. Beauv.

(Wheat Grass.)

Ayuntamiento de Madrid

Ayuntamiento de Madrid

Ayuntamiento de Madrid

Glyceria fluitans. R. Br.

(Manna Grass.)

Ayuntamiento de Madrid

GLYCERIA FLUITANS, *R. Br.* "Manna Grass."
Flora Austr., Vol. VII, p. 657.

STEMS creeping in the mud or floating at the base, ascending to 2 or 3 feet. Leaves narrow, flat, glabrous, the ligula jagged. Panicle loose, long, and narrow. Spikelets solitary in the distant notches, or two or three on a short branch from the same notch, erect, narrow, ½ to 1 inch long, six to twenty flowered, the rhachis glabrous as well as the glumes. Outer glumes obtuse hyaline, faintly nerved at the base, the lowest about 1½ lines, the second longer; flowering glumes more rigid, about 3 lines long, with about seven nerves not reaching to the hyaline obtuse, entire or slightly denticulate apex. Lodicules usually connate.

This perennial species is found principally on the banks of creeks and dams, and often floating on the water, in the coastal districts, but occasionally it is found in New England and other colder parts of the Colony. The upright, creeping or floating succulent stems of this grass are much sought after by horses and cattle, and they may occasionally be seen wading in the water after them. This grass is well worth disseminating on the moist banks of water-courses and dams, which it would not only help to bind, but be a great attraction for wild fowl. The seeds are sweet and palatable, and ducks and other aquatic birds greedily feed upon them. It is a prolific seed-bearer, and the seeds ripen during the summer months, so that there would be no difficulty in collecting any quantity for sowing in suitable places. This grass has a wide geographical range. It is abundant in the northern hemisphere, in the new as well as the old world.

Mr. Sinclair, in the *Hortus Gramineus Woburnensis*, says of this grass:—"At the time of flowering, the produce from a strong tenacious clay is—

	dr.	qr.	oz.	lbs.
Grass 20 oz. The produce per acre ...	.....		217800·0	13612·8
80 dr. of grass weigh, when dry ...	24	0	65340·0	4083·12
The produce of the acre, „ ...	96	0		
The weight lost by the produce drying ...	.....		....	9528·12
64 dr. of grass afford of nutritive ...	1	3	5955·7	372·3
The produce of the space „ ...	8	3		

The above produce was taken from grass that had occupied the ground four years, during which time it had increased every year. It therefore appears capable of being cultivated as a permanent pasture grass, which is contrary to what has been supposed of the "Flote Fescue" (manna grass). Some writers on the subject of grasses inform us that kine and hogs are fond of this grass, and that cows in the spring are frequently enticed into bogs by endeavouring to get at the young shoots, which appear earlier than most other grasses. The result of my observations lead me to believe that when cattle eat this grass it is rather through wantonness than from any particular relish they have for it. Birds are fond of the seeds, and generally strip the panicle ere the seeds are all perfect. Schreber informs us that it is cultivated in several parts of Germany for the sake of the seeds, which are esteemed a delicacy in soups and gruels. When ground into meal they make bread very little inferior to that made from wheat. The bran is given to horses affected with worms, but they must be kept from water for some hours afterwards. Fish, particularly trout, are said to be fond of the seeds. The seeds will not vegetate unless kept very moist; indeed I never could obtain any plants from seed, except when sown in mud. When raised in this manner, and transplanted on a tenacious clay, the plants throve very well, and in the fourth year afforded the produce above stated."

Reference to plate.—A, Spikelet. B, Floret. C, Grain, back and front views. All variously magnified.

Ayuntamiento de Madrid

ERIOCHLOA PUNCTATA, *Hamilt.* "Early Spring Grass."

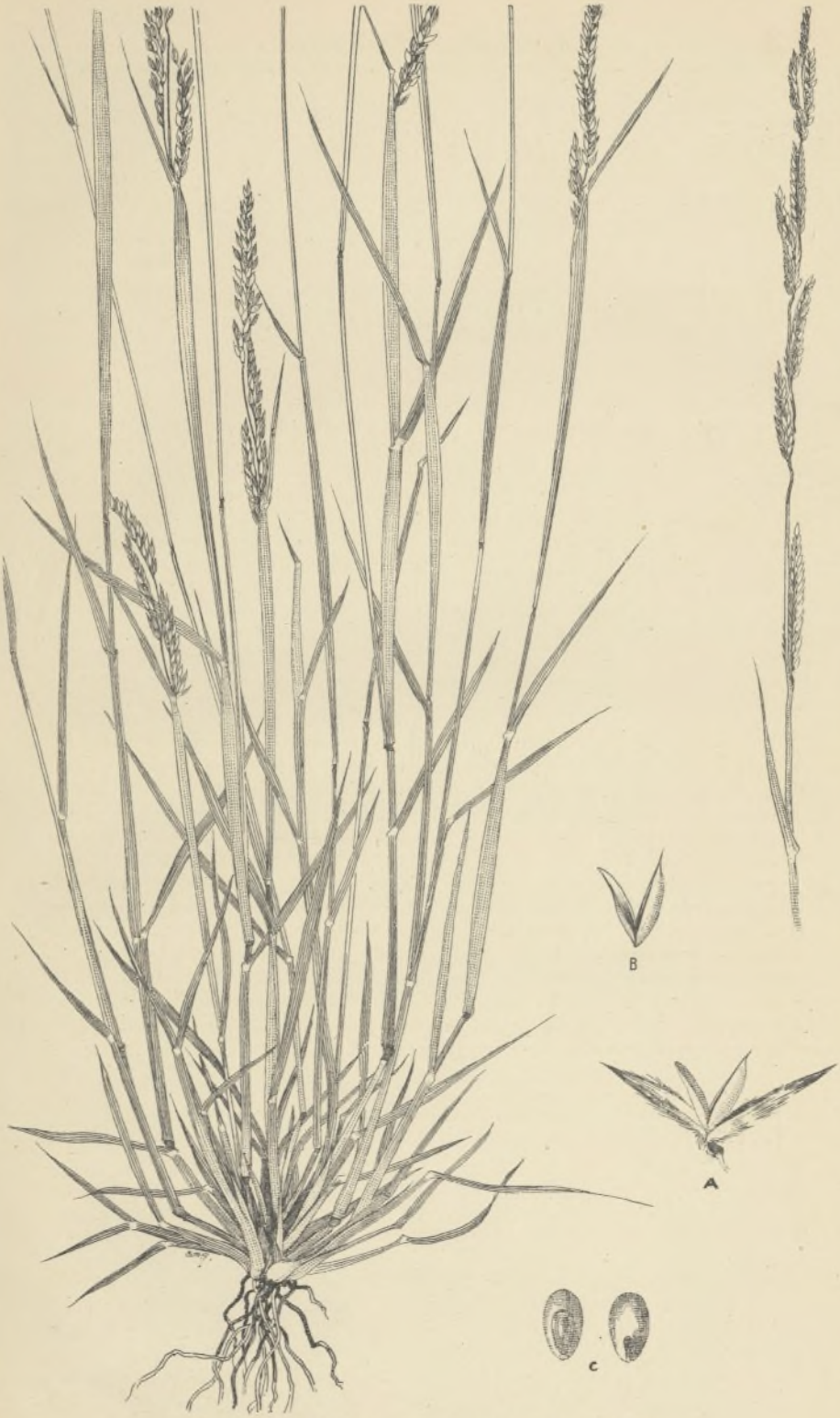
Flora Austr., Vol. VII, p. 462.

An erect grass, attaining 2 or 3 feet; glabrous, except the inflorescence, and sometimes a slight pubescence in the upper part. Leaves rather long; flat or convolute when dry. Spikes or panicle-branches about 5 to 8, distant, erect, secund, the lowest often above 2 inches long, the others gradually shorter; the rhachis, as well as the main axis, pubescent or hairy. Spikelets all pedicillate, but often rather close, the pedicels 1 to 2 lines long, usually bearing a few long hairs, the spikelet ovoid, acute, or shortly acuminate, rather above 1½ lines long, seated on a thick annular or almost cupular disk articulate on the pedicel. Empty glumes, membraneous, broad, and usually 5-nerved, or the inner one rather narrower and sometimes only 3-nerved, both more or less hairy outside, and sometimes rather densely covered with long hairs. Flowering glume much shorter, coriaceous, faintly 3 or 5 nerved, obtuse, but the midrib produced into a point or awn as long as the outer glumes.

This perennial grass is found growing over a greater portion of the Colony, from the coast to the arid interior, and in some situations it is fairly plentiful. It is found growing on various kinds of soils, but the one that suits it best is a deep chocolate loam, where it will produce a rich succulent herbage, much relished by all herbivora. In sheltered situations in the coastal districts this grass will grow all the year round, but in the arid interior it only grows during the summer months. Its tough fibrous roots penetrate the soil to a great depth, which enables it to withstand a very long spell of dry weather. During its early growing period it is easily recognised by its glaucous appearance. Under cultivation it produces a great amount of herbage which can be made into excellent hay. When left undisturbed for a time it produces a great amount of seed, which ripens in November and December. In the interior the inflorescence of this grass is sometimes affected with a parasitic fungus—probably an ustilago.

Reference to Plate.—A. Spikelet. B. Floret. C. Grain, back and front views. All variously magnified.

Ayuntamiento de Madrid



Eriochloa punctata. Hamilt.

(Early Spring Grass.)

Ayuntamiento de Madrid

Ayuntamiento de Madrid

Ayuntamiento de Madrid

Panicum prolutum. F. v. M.

(Rigid Panick Grass.)

Ayuntamiento de Madrid

PANICUM PROLUTUM, *F.V.M.* "Rigid Panick Grass."

Flora Austr., Vol. VII, p. 490.

STEMS from a branching base erect, rigid, 1 to 2 feet high. Leaves rather rigid, the margins involute when dry, glabrous and glaucous. Ligula very prominent, scarious, truncate or slightly jagged. Panicle of 3 to 6 inches long, of numerous slender, divided branches, the lower ones clustered, erect, and enclosed at the base by the last sheath, or at length exserted and spreading. Spikelets on filiform pedicels, ovoid, acute, glabrous, about $1\frac{1}{4}$ lines long. Empty glumes rather rigid, prominently nerved, the outer one obtuse, with scarious margins, more than half the length of the spikelet, 3 or 5 nerved, the second and third nearly equal, acute, 5 or 7 nerved, no palea in the third. Fruiting glume smooth and shining.

This erect, rather rigid, perennial species is found growing principally in the interior, where it is moderately plentiful in some situations. It generally grows on good land that is liable to periodical inundations, and, as it makes most of its growth during the summer months, it is a valuable stand-by for stock when many other grasses are somewhat scarce. It is a valuable grass for withstanding a long spell of dry weather, and, under ordinary circumstances, will retain its greenness far into the autumn months. It is not a good grass to make hay of, as its stems and leaves are too rigid, but as a pasture grass it is hard to beat in the interior. Before the aborigines tasted the sweets of civilisation they used to collect the seeds of this grass in large quantities, and use them as an article of food, after being ground between two stones and converted into a kind of meal. This grass produces an abundance of seed, which ripens at various times of the year. It is worthy of being disseminated in those districts of the interior where it may not at present be growing.

Reference to Plate.—A. Spikelet. B. Showing the size of the outer glume on the spikelet. C. Grain, back and front views. All variously magnified.

Ayuntamiento de Madrid

The supposed Poisonous Plants of New South Wales (both Indigenous and Exotic).

By FRED. TURNER, F.R.H.S.

Many supposed poisonous plants having been sent to the Department for identification from various parts of the Colony, and so many conflicting statements have been made with regard to the effects particular species have upon animals, that it was thought advisable to publish in the *Agricultural Gazette* a list of those plants which have been brought under notice, and invite discussion through the *Gazette* to see if some common understanding cannot be arrived at regarding them.

Even in the same district, some persons will assert that a particular species of plant is poisonous, while others whose testimony is equally reliable, will assert that it makes capital feed. There are, perhaps, no more conflicting statements made than with regard to the genus *Eremophila*, and the allied one *Myoporum*. Whilst I must admit that so very little is known of the physiological properties of the order *Myoporum*, still I cannot close my eyes to the fact that both cattle and sheep, kept in country where these shrubs are plentiful, eat them with avidity, and thrive on them without any ill effects. Some persons assert that these *Myoporinous* plants develop their poisonous properties when in fruit, but whoever has studied the habits of the birds of Central Australia will assert that some of them greatly depend upon the fruits of these plants for sustenance ; which, in fact, in some seasons, are their principal food supply. Moreover, the aborigines in the early days, before they tasted the sweets of civilisation, used to eat the fruits of several *Myoporinous* plants. There is no doubt that when cattle and sheep are taken from one district to another, where the natural herbage is somewhat dissimilar, it must have, for a time at least, some effect upon their systems, especially when they are taken from rolling downs of grass to country where shrubs and herbs predominate, and this brings to mind a question which I think has not received the attention of stock-owners that its importance justifies, viz., the mechanical action that hard-foliaged shrubs have upon the larynx of both cattle and sheep which are not used to eating them. This irritation of the larynx not only brings on laryngitis, but often extends to and brings on inflammation of the intestines. Further, when hungry sheep have partaken too freely of some leguminous plants, especially when in full growth and with seed on them, they have died. But this is caused during the process of digestion, when great volumes of gas are formed which cause an abnormal distention of the stomach, thus preventing the lungs working freely, and of course strangling the animals. On this

Ayuntamiento de Madrid

account many leguminous plants are called poisonous which are not really so. Still, these causes could not account for all the sheep that die somewhat mysteriously. I use the word "mysteriously" advisedly, for many plants have been sent to me as poisonous which, on examination, have proved to be quite harmless. Nor is my case a singular one; many others have had the same experience. No doubt there are some poisonous plants in the country, but unless animals are sickly, weakly, or hard pressed for food their natural instincts will lead them to avoid browsing upon them. We have a far more insidious enemy to contend against in the parasitic fungi which affect grasses and herbs, not only in the damp coastal districts, but far into the interior. Some few years ago I drew attention to the great increase of parasitic fungi on some of our most valuable grasses and herbs, and I then said, what I think now, that fungoid growth on grasses and herbs is the primary cause of many sheep dying so mysteriously. We have abundant proof of the destructive agency of microscopic fungi on both animals and plants that have not sufficient vigour to repel them. The life history of these native fungoid growths is well worthy the attention of specialists, if only to show what their effects are upon animals. Now that the Department has drawn the attention of our pastoralists and farmers to this important matter, it is to be hoped that it will be thoroughly sifted and placed out of the mere region of theory and speculation to that of hard practical matter of fact. Of course we are well aware that it will take some years of careful observation before everything can be set at rest to satisfy everyone; for much of the prejudice at present existing about some plants is that of mere hearsay evidence, which is handed down as Gospel truth without the slightest inquiry being made as to its correctness. Unfortunately I cannot give the common names to all in the accompanying list of supposed poisonous plants, for the simple reason that many of them come to us merely marked "poison plants." I am well aware that scientific names do not "go down" with pastoralists and farmers, and it cannot be expected that they should, for everyone has not the leisure to learn the scientific nomenclature of plants. To overcome this difficulty, however, the Department purposes giving illustrations in the *Agricultural Gazette* of all the supposed poisonous plants that are in the Colony, so that everyone can be made thoroughly familiar with them.

The aid of all pastoralists and farmers is solicited in this undertaking. Specimens may be sent to the Director of Agriculture, Phillip-street, Sydney, and should consist (if small plants) of roots, stems, leaves, flowers, and fruits (seeds). If from large plants, shrubs, or trees, the specimens should consist of stems, leaves, flowers, and fruits (seeds). In all instances the Department would like the common name of each specimen, and all the information that can be given with it. This information will, of course, be of value to the Colony.

1. Anthocercis albicans, *A. Cunn.*
2. Anthocercis eadesii, *F. V. M.*
3. Anthocercis hopwoodii, *F. V. M.*
4. Anthocercis scabrella, *Benth.*
5. Argemone mexicana, *Linn.* "Devil's fig," "Mexican poppy."
6. Asclepias curassavica, *Linn.* "Red-head," "blood flower," "silk weed."
7. Beyeria viscosa, *Miq.*
8. Bulbine bulbosa, *Haw.* "Wild onion," "wild yam."
9. Bulbine semibarbata, *Haw.* "Native leek."

Ayuntamiento de Madrid

10. Datura stramonium, *Linn.* "Thorn apple," "Devil's trumpet," "stink-weed."
11. Euphorbia australis, *Boiss.* "Spurgewort."
12. Euphorbia drummondii, *Boiss.* "Milk weed," "spurgewort."
13. Euphorbia eremophila, *A. Cunn.* "Spurgewort."
14. Goodia lotifolia, *Salis.* "Yellow pea."
15. Hoya australis, *R. Br.* "Wax flower."
16. Indigofera australis, *Willd.* "Native indigo."
17. Isotoma axillaris, *Lindl.*
18. Lobelia anceps, *Thunb.*
19. Lobelia pratioides, *Benth.*
20. Lobelia purpurascens, *R. Br.*
21. Lotus australis, *Andr.*
22. Myriogyne minuta, *Lees.* "Snuff-weed."
23. Nicotiana suaveolens, *Lehm.* "Native tobacco."
24. Omalanthus populifolius, *Grah.* "Bulli poison bush."
25. Papaver horridum, *D'C.* "Prickly poppy."
26. Pimelia pauciflora, *R. Br.*
27. Pimelia simplex, *F. V. M.*
28. Pratia erecta, *Gaud.*
29. Pratia pedunculata, *Benth.*
30. Pratia puberula, *Benth.*
31. Ranunculus parviflorus, *Linn.* "Buttercup."
32. Ranunculus rivularis, *Banks.* "Buttercup."
33. Ricinus communis, *Linn.* "Castor-oil plant."
34. Solanum armatum, *R. Br.*
35. Solanum esuriale, *Lindl.*
36. Solanum nigrum, *Linn.* "Blackberried night shade."
37. Solanum sodomæum, *Linn.* "Black-spined night shade."
38. Stachys arvensis, *Linn.* "Hedge nettle," "stagger weed."
39. Swainsona galegifolia, *R. Br.* "Indigo," "cranky pea," "Darling pea."
40. Swainsona greyana, *Lindl.* "Darling pea."
41. Trachymene australis, *Benth.*
42. Trachymene pilosa, *Sm.*
43. Tephrosia purpurea, *Pers.*
44. Trema aspera, *Blume.*
45. Wikstrœmia indica, *C. A. Mey.*

Ayuntamiento de Madrid

Suitability of New England for Beet-growing.

By J. A. DESPEISSIS, M.R.A.C.

The following interesting report on the suitability of the soils and climate of the New England district, and their value for beet-growing, has been furnished by the Inspector as the result of a recent visit.

Aspect, climate, geological formations.

The New England district, comprising all that part of New South Wales extending northwards along the Dividing Range from Armidale to Tenterfield, measures 121 miles in length, with a breadth of 40 to 45 miles towards Inverell to the westward. It forms a series of plateaus and stretches of undulating country, rising from an altitude of 3,300 ft. at Armidale to 5,000 ft. at Ben Lomond, falling again to 2,827 ft. at Tenterfield, with a gentle westwardly slope, the altitude at Inverell being 1,950 ft.

The high altitude of this table-land thus counteracts the influence of the latitude, which ranges from 29° 5′ to 30° 34′ S., and makes the district one of the coolest in the colonies.

Although distant only 80 to 90 miles in a straight line from the sea, which limits to the east the North Coast district, the difference in the climate and capabilities of the two districts from an agricultural point of view is very remarkable. Whilst in the North Coast district the sugar-cane, the coffee plant, the mango tree, and other tropical and semitropical products grow luxuriantly, crops and fruits of temperate countries, such as oats, apples, pears, cherries, and all the English and European fruits and crops, are obtained to great perfection on these uplands.

The geological formations of the country consist of an axis or framework of granitic and porphyritic rocks, which form the backbone of the Dividing Range, and have been covered by extensive patches of trap and basalt cast on the surface by volcanic disturbances. Thus, except on the bare granitic hills, the country is generally very fertile, and will grow almost anything where the climate permits. The oat and wheat crops of the New England district are noted as being among the heaviest raised in the Colony, and lucerne, root-crops, potatoes, maize, and artificial grass, yield big returns; whilst in some localities, well sheltered from the winds, European fruits grow to great perfection, especially at Armidale and at Tenterfield, which limit the table-land to the south and to the north respectively.

Ayuntamiento de Madrid

The rainfall varying from 26″ to 35″, on an average, per annum, is sufficient for the requirements of the crops.

In a future number of the *Agricultural Gazette* I purpose describing, either separately or collectively, the agricultural resources of the district as regards general farming, dairying or fruit-growing; but I shall restrict myself in the present issue to the consideration of the suitability of both soils and climate for the successful cultivation of the sugar beet.

Prospect of the Sugar Beet Industry in the District.

The desirability of suggesting to farmers new crops capable of being grown between two corn crops, and thus introducing in their general system of cultivation a rotation beneficial both to the land and the ensuing crop, whilst leaving a profit besides; and the importance of establishing in this Colony a new industry providing employment for a large number of hands, and supplying a kind of commodity for which the Colony is largely dependent on foreign markets, have led the Department of Agriculture to inquire into the conditions of climate and soil of the New England district for the purpose of ascertaining their suitableness for the profitable cultivation of the sugar beet.

The introduction of this new industry far from hampering the progress of the flourishing sugar cane industry of the North Coast districts, will, on the contrary, have a beneficial effect on it; and the two rival industries will, it is expected, thrive side by side, within a distance of a few miles—thus benefiting each other by the comparison of their improved methods of working, and bringing the manufacture of sugar in this country to a high state of perfection. The consequent rise in the value of agricultural land capable of growing good crops of either sugar-cane or sugar-beet, would be accompanied by a considerable increase in the population of those parts of the Colony, suitable for the cultivation of sugar-yielding plants, and give employment to labour of the most varied kind—both skilled and unskilled—besides saving the country an annually increasing expenditure of money outside the Colony, which, at the present moment amounts to £850,000 per annum for Sugar imported for consumption in this country.

The kind of soil suitable for the cultivation of sugar-beet may vary very much, provided it is rich enough and well drained.

The conditions, however, required for a good sugar-beet soil are those met with in a deep loam, which gives much nourishment to the roots to the full depth to which they penetrate.

Like all plants with a tap root, beet does not particularly like very stiff and clayey soils, but prefers a sort of sandy loam, or easy working and porous soil, containing, in sufficient quantity, the nutritious elements of the plant; it is then rich in sugar and keeps better.

Soils containing too much undecomposed organic or vegetable matter, such as heavy black soils, should be avoided; such soils more especially if they are impregnated with alkaline salts, grow beets of enormous size. Such beets, however, absorb the salts so readily, that they subsequently materially interfere with the extraction of crystallisable sugar, and the appearance of the sugar is never so fine whilst the proportion of molasses is considerably increased. On the other hand, in stony soils full of pebbles, the beet is apt to throw many roots and is more difficult to clean, and pulpify or slice off.

Ayuntamiento de Madrid

In the New England district, good soils of various descriptions abound, ranging in character from that of the light, friable sandy loams which have been washed down from the granite hills around and vary from 6″ to 24″ in depth, to that of a stiff and retentive black earth, which has been deposited along the gullies and depressions of the ground by the wash of silt and vegetable matter from the volcanic country around.

Although exceedingly fertile, this bottom land requires to be handled with much discernment, owing to its peculiar physical character. Deep drainage is almost imperatively necessary on such soil; banking up in places, to keep off flood waters, as well as liming, to modify its heavy physical character, would much improve its nature. Such soil, very rich in soluble salts, is quick, warm and forcing, and eminently suitable for the growth of heavy crops of the larger sorts of feeding roots or mangel wurzels, for which the New England district has attained notoriety at agricultural shows. There is much of this bottom-land, which is, in some places, many feet deep; but it should not be chosen if sugar is the object, as it is too rich in mineral salts, especially of the alkaline earths, and the roots, whilst gaining much in quantity, would deteriorate in quality—becoming watery and impregnated with salts which lessen the purity of the juice, and so make the extraction of sugar more difficult.

The deep, red soil resulting from the disintegration of the basaltic rocks, is among the best in the district. It contains in abundance vast stores of all the elements required by our cultivated crops; it is fairly retentive of moisture, but does not get water-logged, its porous and friable character permitting a thorough drainage, and a free circulation of the atmospheric air, which always keeps it sweet and healthy.

This red soil is found with an average width of 20 miles, extending in a southerly direction from Glen Innes, to some distance from Ben Lomond, and again from Glen Innes to Inverell to the west. This represents an area of about 1,600 square miles; it combines, also, all the conditions required for a good sugar-beet soil, viz., fertility, depth, porosity, a warm colour, and constitutes many level or slightly sloping plains, easy to work, and on which heavy showers have no denuding effect.

Climatic conditions.—As regards climate, I shall, after quoting such an authority as Mr. de Vilmorin, who has done so much for improving the sugar yielding capabilities of the beetroot, compare what a good climate for the sugar-beet should be, with the climate of the New England district, according to the data furnished by the Government meteorologist.

"The climatic conditions," says Mr. de Vilmorin, "to which the sugar-beet may be subject, have a very important influence upon its value for sugar production. A medium temperature, averaging from 65° to 70° F. (18° to 21° C.), during the growing months, a somewhat rainy summer, and a clear, rather cold autumn, will be found most favourable to the proper development of the crop. Such conditions usually prevail in German-Saxony, the Rhenish Provinces and north-eastern France, where the culture of the sugar-beet has attained the highest development and yields the largest profits. Those districts in which a warm moist spring is followed by a hot, dry summer, cool rainy autumn, with a period of warm or temperate weather in October and early November (autumn months), are especially detrimental to the crops for sugar production. The greatest damage to be feared arises from the failure of the crop to ripen well, on account of the growth being kept up by warm rainy weather toward the close of the season."

Ayuntamiento de Madrid

The following table is instructive as illustrating the average temperature and rainfall for each month of the four seasons, at Glen Innes and at Tenterfield, two important centres of New England :—

		Glen Innes.		*Tenterfield.*	
		Mean temperature in the shade.	Rain.	Mean temperature in the shade.	Rain.
Spring	September ...	53·5	2·30	55·7	1·30
	October	60·	1·85	63·3	1·20
	November ...	68·5	2·90	68·7	2·80
Summer....	December ...	70·5	5·26	70·6	6·60
	January	72·5	5·60	73·8	3·30
	February	73·	4·75	73·3	2·50
Autumn ...	March	67·5	2·30	66·3	3·40
	April	60·7	1·	60·3	1·30
	May	53·5	·80	54·4	·50
Winter ...	June	47·5	3	49·3	3·
	July	43·5	·70	44·9	·40
	August	48·5	·35	50·	·35

This table shows :—

1. That the average temperature, during the growing months, varies from 60° to 75° Fah.
2. That the spring or period of germination is warm and moist, thus favouring the raising of the seeds and the striking of the young plants.
3. That a hotter and moister summer, or period of vegetation, would still further push on the growth of the crop and the formation of vigorous leaves, capable of assimilating large quantities of carbon, oxygen, and hydrogen, from the air, and fixing them as glucose in the tissues of the roots. Concurrently with this action, the root, by means of its meshwork of feeding rootlets, absorbs both mineral and nitrogenous substances from the soil, and builds up cells and tissues for the reception and storage of the "carbo-hydrates," which have been elaborated and fixed by the action of the leaves.
4. It also shows that during the cooler and drier autumn, which constitutes the period of saccharification, the plant is enabled to store up, as a reserve to be drawn upon for future use if allowed to seed next year, a large amount of the sugary material formed in its tissues, and the glucose is turned into sucrose or crystallisable sugar, which, as such, cannot serve as food for the plant.

In this period, dry cool weather is necessary. If the days be sunny the beets will become rich in sugar, but if the autumn be wet, the crop will be bulky but poor in sugar. If after a dry summer a warm and rainy autumn follows, new leaves will spring up at the cost of the sugar collected in the tissues of the root.

5. The winter in fine is sufficiently dry and cold in New England for facilitating the operations of carting and manufacturing, and keeping the roots stored in pits or silos free of fermentation, and in a healthy condition.

Having thus reviewed the characteristics of the soils and climate of New England, it may be said that the area of land available for the cultivation of sugar-beet extends from Ben Lomond to Glen Innes, or a distance of 50 miles in length, and 20 to 25 miles in breadth, and from Glen Innes, in the direction of Inverell, to a distance of about 25 miles, with a similar width, making in all about 1,200 square miles.

Ayuntamiento de Madrid

Assuming that only one half of that area would be suitable for growing suger-beet, this would give 600 square miles of country, or 384,000 acres. Large tracts of land, besides, near both Armidale and Tenterfield, would grow beet at a profit, and at very little cost.

That the climate and soil of these upland districts are eminently favourable to the growth of plants of the beet family, has long been demonstrated by the enormous roots of mangel wurzels exhibited in the show-yards of the Agricultural Society of New South Wales, and at the shows of other agricultural associations.

I have before me complete analyses of samples of sugar-beets grown near Glen Innes, in Central New England, from seeds imported by Mr. St. Vincent of the *Glen Innes Examiner*. These analyses, as may be gathered by a glance at the subjoined table, give a most encouraging indication of the suitability of the crop for the district.

	Samples pulled in March about two weeks old when analysed.			Samples pulled middle of May, two months old when analysed.	
	14 lb.	14 lb.	4 lb.	Long shaped.	Round shaped.
	Same beet.				
	No. I.	No. II.	No. III.	No. IV.	No. V.
Cane-sugar (sucrose) ...	6·04	6·19	4·96	9·82	14·53
Fruit-sugar (glucose) ...	3·90	4·00	5·80	2·31	1·57
Other organic matter ...	2·28	2·42	·67	1·98	2·25
Ash (soluble)	·73	·52	·90	1·25	·65
Total soluble matter ...	12·95	13·13	12·33	15·36	19·00
	per cent.	per cent.	per cent.	per cent.	per cent.
Insoluble matter { Fibre...	1·97	1·95	2·51	3·77	3·63
Insoluble matter { Ash ...	·19	·21	·26	·37	·31
Water	84·89	84·71	84·90	80·53	77·06
	100·00	100·00	100·00	100·00	100·00

With the exception of No. IV and No. V, none of the above beets would be fit for profitable manufacture into sugar. Of these two, No. V is by far the best, and is indeed a rich variety of sugar-beet; if pulled later in the season, instead of at the end of the autumn, viz., after the process of saccharification had been more complete, they would have shown a still greater percentage of crystallisable sugar, with a proportionate decrease of uncrystallisable, or fruit-sugar. In a ripe sugar-beet, fruit-sugar should hardly be traceable. The percentage of soluble salts in No. V. is as low as can be expected, whilst rather high in No. IV.

Nos. I, II, and III were evidently very unripe when pulled, and besides, judging by their heavy weight, could hardly be beets of the sugar yielding varieties, and would be more profitable to the distiller than to the sugar manufacturer.

The inference drawn from the analysis of No. V, is of the most encouraging nature, and goes to prove that the success of growing sugar-beet in the New England district rests with the proper selection of the best varieties of seeds, the climate and soils having proved that they can be depended upon in developing the qualities peculiar to the variety grown.

Subjoined, I give the analysis made by the Analytical Chemist of the Department, of a sample of beet I brought back with me on my return from the New England district.

Ayuntamiento de Madrid

The beet, I must say, possessed more of the characters of the mangle-wurzel, than of the sugar-beet, being bulky and not so heavy as might have been expected for its size; it had been grown on the rich, but unsuitable alluvial black earth referred to in this paper:—

Weight of beet=4·73 kilo., or, 9½ lb.; grown at Glen Innes.

Cane-sugar	5·07	per cent.
Fruit-sugar	.98	,,
Ash { Sol.	1·23	,,
Ash { insol....	·17	,,
Water	76·36	,,

In view of the success which has attended some of the experiments attempted in growing beet in New England, and the apparent suitability of the soil and climate for the profitable cultivation of that crop, it would be highly desirable if some careful experiments and investigations were conducted by the Department, on such a scale as to determine with some measure of certainty the capabilities of the district for growing paying crops of a beet rich in crystallisable sugar.

From the firm of Vilmorin Andrieux & Co., No. 4, Quai de la Megisserie, Paris, and from some well known German firms, a collection of seeds of the best varieties and of the highest character, sufficient to sow 8 or 10 acres might be procured, and distributed among farmers possessing suitable land, and willing to co-operate with the Department in this matter.

The practice in France, is to sow thickly with 20 to 25 kilos. of seeds to the hectare—16 to 20 lb. to the acre—thinning out afterwards. Each farmer might experiment upon, say, ½ acre with the different varieties, according to instructions furnished by the Department; and at the time of pulling the yield per acre noted, and representative samples might be taken and a sugar determination made, with a view of deciding the variety for growing which could be most highly recommended.

Some varieties are extremely rich in sugar, and others, while still rich in sugar, also produce a heavy yield to the acre.

It is clear that the same variety of beet, considering distances, &c., would not be most advantageous in every case, and it is only by experiment that it is possible, in any given locality, to find out varieties equally profitable to the farmer and manufacturer.

Generally speaking, those varieties which give the largest yields of bulky roots contain the smallest proportions of sugar, and conversely the kinds richest in sugar, yield the lightest root crops per acre. Local considerations connected with the cartage of the crop, the price obtained for roots, the value of food for animals, &c., determine what varieties are best adapted for any given place; then again, the precocity of the time of ripening and the keeping quality of the roots, are points of consideration in the selection of the varieties intended to be grown.

In some parts of Europe, the cultivation of the beet-root has been the means of creating two important and flourishing industries—the sugar industry and the distillery; it has, besides, considerably increased the raising of live-stock on the land, since the refuse of these industries furnishes a large amount of cheap and useful food for farm animals; the fertility of the land also, owing to the good cultivation which the crop requires, has been maintained and in many cases improved, resulting in an increase of the subsequent crop. It is much to be hoped that the systematic and extensive cultivation of the sugar-beet in the Colony, will have the same beneficial effects for the country, and for those who turn it to profit.

Ayuntamiento de Madrid

Sorghum.

It is intended, in this paper, to draw the attention of Agriculturists to the value of sorghum for the food it furnishes to man in the form of flour from grain, of sugar and of molasses ; and to animals in the form of green food, ensilage or grain. Although the farmers of this Colony have cultivated sorghum for green food and ensilage, yet it has not been to the extent it merits ; whilst its value as a source of sugar has been scarcely recognised, notwithstanding that its value for the purpose has been conclusively shown in the United States by exhaustive investigations, and the financial results of a number of sorghum-sugar factories, to be a highly commercial one. This plant also furnishes, in addition to sugar, and at the same time a large quantity of syrup of best quality, seed, and other by-products of commercial value. It is, in fact, a plant which has been found to pay the farmer to cultivate, the manufacturer to extract its sugar, and the labourer to earn good wages in handling it. Our climate is suitable, much of the sugar consumed in this Colony has to be imported at present, a much larger area is suitable for it than for sugar cane, and the cultivation of it may be combined with that of sugar cane, in order to extend the season of manufacture, and to utilise expensive machinery for a much longer period than is possible at present.

Sorghum as green food for stock.—The value of sorghum, for the excellent green food it will furnish during the middle and end of our hot summer months, has not been sufficiently recognised. The area cultivated last year for this purpose did not exceed 6,173 acres, and the districts where it was principally grown were the coastal ones. Although it has here and there extended inland, yet it has not been generally recognised that sorghum will do well wherever maize will grow, and, provided it gets a good stand in the earlier part of the season, will even flourish during a drought far too severe for maize. Three to four crops can be obtained in a year from sorghum, which, whether in the form of green food, or chopped with straw, is very much relished by stock.

Ensilage.—The quantity of ensilage already made in this Colony is comparatively small ; but as this method of storing up stock-food for future requirements becomes more general, it is certain that sorghum will form one of its principal constituents. Sorghum holds a high place for this purpose in the United States.

Sorghum Seed.—It is worthy of note that the clean seed, as food for man or animals, is fully equal in value to either maize or oats, and but little inferior to wheat. It can be fed to stock to the best advantage when ground, since its small size and hardness may lead to defective mastication, and therefore less perfect digestion than is the case with maize. The chief objection to the use of sorghum seed for this purpose has been "on the supposition that it contained tannin or some bitter principle which would prove injurious to stock." Careful examination has failed to discover the presence of tannin, and the only possible injurious principle which it contains is the colouring matter of the glumes or envelopes of the grain. Any possible ill

Ayuntamiento de Madrid

effects from this colouring matter can be removed by separating the grain from the glumes, which would not be a difficult mechanical process. There are varieties of sorghum, such as white African—which has been already introduced into this Colony—which have seed free from glumes containing this colouring matter. Dr. Collier, of New York, says:—"The average report from twenty-one different states, gives the yield as 30 bushels of seed per acre."

Sorghum as a Source of Sugar.—In the year 1877, Dr. Peter Collier, at that time chemist to the Department of Agriculture at Washington, gave considerable attention to the value of sorghum as a source of sugar, and the results he obtained pointed so clearly to the establishment, in the future, of an industry of commercial importance that the Government, companies, and individuals of the United States have gone on experimenting with sorghum, until it has been shown that the manufacture of sugar from it can be made a financial success. In the year 1888, so many sorghum sugar factories were starting that it was found impossible to get a sufficient number of competent men to take charge of them. Dr. Wiley, who has had charge, for a number of years, of the experiments conducted by the United States Agricultural Department, says, in one of his reports, that with careful control, and proper selection of locality, the industry will be financially successful. This, then, is an industry worthy of the careful attention of our farmers, and those interested in the production of sugar, if there is an opening for such, and if the climate and other conditions of this Colony are favourable. The fact that we had to import, during last year, sugar to the value of £851,320 over the value of that exported, is a sufficient indication of the opening which exists for such an industry. The following account of the climate of this Colony, compared with that of those places in the United States where sorghum-sugar factories are located, will be sufficient to indicate its suitability for the cultivation of sorghum for sugar.

Climate.—The temperature of those parts of the United States where the cultivation is carried out on a commercial scale, ranges, during the season for sorghum, from 107 to 10 degrees, the mean temperature for the same time being about 65 degrees, whilst the rainfall is about 20 inches. It will be seen from this that the climatic conditions of a great part of this Colony are just as favourable, and even more so with respect to cold weather, for neither severe droughts nor excessive rains are favourable to the full development of the plant. The effect of a dry climate is, on the whole, good, for it causes the juices to thicken, and so protects them from deterioration.

The effect of cold weather on sorghum has been summarised as follows:—

(1.) A frost severe enough to kill the blades of immature cane, will spoil it for sugar-making.
(2.) Such a frost on ripe cane will not do it any notable injury.
(3.) A frost severe enough to congeal the water in the cells of the cane will render it unfit for sugar-making immediately on the occasion of thawing weather.

It is of importance, therefore, that the time from when the last frost occurred, till the first one of the next season appears, be as long as possible, for the longer the harvest, the longer the factory can be employed, and therefore the more economical will be the management. The harvest season of sorghum can be considerably extended, as it will stand for some time in the field after it is ripe, without any decrease in the quantity of sugar content; and varieties of sorghum can be selected, and planted at such times as to ripen in order over a considerable period. Dr. Collier gives the following

Ayuntamiento de Madrid

as the number of days which the principal varieties take to mature :—Early Amber, 85 days; Links Hybrid, 101; White Mammoth, 102; Orange, 117; Liberian, 152; and Honduras, 163 days.

Where sorghum is cultivated for sugar in the United States, the period of favourable conditions is about six months, whilst here it would extend over eight months. The date for planting in any district must be such that the last frost will have appeared before the plant is out of the ground.

The sugar contents of sorghum.—"No known processes of science save those of plant growth, says Professor Cowgill, produce the peculiar combination of carbon with the elements of water, which we call sugar." In sorghum there are three substances of nearly the same composition, viz., starch, sucrose, and cane sugar. Their composition may be stated as follows :—

	Carbon.	Water.
Starch	12	10
Sucrose Cane or crystallisable Sugar ...	12	11
Glucose or Grape Sugar	12	12

Though the chemist "can produce glucose from either starch or sucrose by treatment with acid, yet all his attempts to produce sucrose from either starch or glucose have failed." Moreover sucrose when in solution in the juice of the plant is changed very rapidly into glucose, if the canes have been injured by being blown down, if they are cut during warm weather and not immediately worked up, and if, as already pointed out, they are attacked by frost at certain stages of growth. This change is called inversion, and should if possible, be prevented since glucose is a substance which it is very difficult to crystallise. In fact, the presence of glucose and other solids than sucrose in the cane is very undesirable in the manufacture of sugar, for they prevent at least two-fifths of their weight of sucrose from crystallising. The aim should be, therefore, to produce such varieties of sorghum as are richest in sucrose, with the content of glucose and other solids not sugar, as low as possible.

It will be found that seed selection, nature of the soil, and system of cultivation pursued, are of considerable importance in this respect. For under favourable conditions, says Dr. Wiley, 120 to 125 lb. of sugar per ton of cane can be obtained. The average yield of sorghum per acre under ordinary conditions is 8 tons, and under favourable conditions 10 tons, although as high as 13½ tons have been obtained. Under favourable conditions, therefore, from 1,200 to 1,250 lb. of sugar per acre could be depended on. The quality of this sugar is equal to the best. "It has a hard, firm, medium sized, well-cut grain," and its sweetening power is not surpassed by any raw sugar.

The point of most importance is, however, what per cent. of sucrose in cane will pay. Dr. Wiley is of opinion that if sorghum contains 12 per cent. sucrose and 2 per cent. of other sugar, it would be difficult to make syrup and not sugar. The Director of the Delaware Experimental Station estimates from careful calculations that if a cane contains less than 9 per cent of sucrose in its juice, it will pay best to make molasses only. Molasses is, however, one of the most valuable contents of the cane. It would be possible to get from cane, containing less than 9 per cent. of sucrose, about 11·6 gallons of excellent syrup.

Selection of Seed and varieties.—The selection of seed and varieties will be found to be one of the best ways of improving the sugar content of sorghum. The whole success of the sorghum-sugar industry depends—as has been shown—on the content of sugar being up to a certain limit, whilst

Ayuntamiento de Madrid

the higher it is above that the better. The sorghum plant is, however, at present one of the most variable, being sometimes a good sugar producing plant, and sometimes merely a syrup producing plant. This is to be expected from a plant which has not yet been "bred up to fixed types of excellence by long continued selection of seeds from the finest plants of the best varieties." Judging from experiments which have been already carried out, and the analogous case of the beet—the sugar content of which has been raised from 5 or 6 to about 12 per cent.—it is anticipated that it is possible to improve the sorghum plant as follows:—

(1). To increase the percentage of cane sugar in the juice of the cane; and (2), To diminish the percentage of substances, such as glucose, in the juice, which lessen the yield of sugar.

The methods for doing this have been stated as follows:—

(1). By hybridising or crossing the varieties:—Crossing seems to increase the vigour of the plants in a wonderful way, and has other beneficial results as to sugar content, of which the following is a specimen: Sucrose, 16·85; glucose ·91; purity, 74·89.

(2). By preserving sports or variations: The sorghum plant is one of the most variable, and it is anticipated from the success which has been achieved with sugar cane and beet, that some of the variations from the kinds of sorghum already known may have a high sugar content.

(3). By growing and testing all known varieties, and selecting seed from finest individual canes of each.

In general it may be stated that the production of new varieties is not so much desired as the improvement by selection, proper cultivation and fertilisation of the varieties already known. With this end in view experiments were conducted during 1888 in the United States with varieties of sorghum obtained from all parts of the world. The results obtained are very interesting on account of the excellent position which the well known varieties of sorghum of this Colony held with regard to sugar content. It has been already pointed out that if the sucrose present be less than 9 per cent. it is best to make molasses and not sugar. The average of all the varieties tried was above this number, and also in case of those from Sydney. It should be stated, however, that probably Australian varieties would have done even better if they had been acclimatised. Seven different varieties of early Amber were tried.

	Sucrose.	Glucose.	Purity.
The average of the best gave	13·18	1·07	75·14
The average of Early Amber from Sydney ...	9·01	2·62	62·57
The average of the worst variety not reckoning the one from Sydney	9·39	2·83	61·97

The Early Amber is an excellent variety for producing syrup of a pleasant taste. It holds a high place in the list of varieties planted for sugar.

Chinese Cane.—Seven different varieties were tried.

Local variety gave 13·23 sucrose; 1·40 glucose; 69·63 purity.

Sorghum saccharatum from Sydney gave 9·76 sucrose; 2·25 glucose; 59·91 purity.

The other varieties were as a rule better than sorghum saccharatum.

Orange.—One of the varieties (Early Orange) had been grown for some time for sugar, and its qualities consequently showed remarkable uniformity as to content of sucrose, which averaged very high. None of the varieties come from Australia.

Ayuntamiento de Madrid

Red Liberian.—Nine varieties were tried, one being from Sydney (Planters' Friend), gave 13·83 sucrose; 1·66 glucose; 67·46 purity. The whole of the Red Liberian varieties have an excellent content of sucrose, but the Planters' Friend gave a better return than all but one of them.

As showing the class of canes from which seed were selected for future cultivation, it may be stated that ten varieties out of the whole number tried were considered worthy of special attention, and that the Planters' Friend was one of these. Last year the experiments were supplemented by still more elaborate experiments carried out at Kansas Experimental Station, where seed selected from best varieties of the previous year gave even better results. From a review of results obtained wherever conditions were favourable, it appears that there will be no difficulty in getting a sufficient number of varieties which will give 13 per cent. sucrose. With 13 per cent. cane, says the Director of Experimental Station, Kansas, expenses could be paid if sugar fell to 1½d. per lb., and molasses to 6½d. per gallon.

The comparisons that have been made by enthusiasts between content of sugar in sorghum and that in sugar-cane, and in favour of the former plant cannot, however, be supported in actual manufacture until the sorghum plant has been improved, and bred up to a fixed standard in the manner already detailed.

Soil.—Mr. Denning, who had charge of the experiments carried out during 1888, at Conway Springs, Kansas, says:—"Dark heavy soils produce a stalk of abnormal size, containing as a rule a large per cent. of sugars which reduce the amount of crystallisable sugar; light thin soils produce an undersized stalk, perhaps 4 feet long, maturing but a handful of seed, and showing a high per cent. of crystallisable, and a low per cent. of reducing sugar." High content of sugar was obtained from sorghum grown on sandy loam. Professor Stubbs says, "dry well-drained loamy soils are best adapted for sorghum."

Fertilisation.—Judicious fertilisation will be followed by excellent results. The waste chips of the sorghum left over from manufacture may be used as a manure. Experiments made with other manures have shown that nitrogen prolongs vitality in the cane; combination of potash with nitrogenous fertilisers is best for large crops and high testing juice; phosphoric acid hastens ripening of the cane, whilst too much of it reduces quantity of sugar in the juice; and potash makes large and strong stalks.

Cultivation.—One of principal drawbacks to be avoided is that of having mature and immature canes in same row, for this renders harvesting more difficult and expensive. In order that all plants should as nearly as possible ripen at one time, the cane should be planted on land the same day it is ploughed, "care being taken to cover the seed with earth at a uniform depth." This depth should be sufficient to ensure moisture, but must not be beyond the sun's warmth. For these reasons it is better to drill in or plant the seed by machinery instead of by hand. A slight excess of seed should be planted, and the hoe used to properly thin the plants before they are 4 inches high. Good soils will produce a stalk of cane for each 4 inches of row-space. When the rows are 42 inches apart, two stalks should be allowed a space of 10 inches, three stalks 18 inches, four stalks 30 inches, six stalks 42 inches, and never more than six stalks in any one bunch. After the young plants come up, cultivation for the purpose of loosening the soil and destroying the weeds should be carried out merely upon the surface of the land, in order to avoid cutting and otherwise injuring the roots, since if the roots are injured in any manner the yield of sugar will be materially lessened.

Ayuntamiento de Madrid

Manufacture.—The machinery used for extraction of sugar from sorghum is capable of little further improvement. However, in order that it may be run at the maximum profit, the following conditions are necessary:—

1. The determination of maturity and the quality of the cane, and of the juice during the different factory processes, must be under the control of one capable of conducting chemical analyses: the sugar boiling must also be done by a competent man.
2. The supply of water should be abundant, handy, and as pure as possible.
3. The maximum distance over which a farmer would have to cart the cane to the mill should not, on account of expense, exceed 1 mile and a half, although this distance may be increased in case of a tram line being laid down.
4. A sufficient quantity of varieties which mature early and late should be sown so as to ripen one after another in time, and keep the factory constantly going during an extended season.
5. The capacity of the factory should be such that average cost of production will be as little as possible. Dr. Wiley and others most competent to express an opinion on this subject, say that a factory of the capacity of 200 tons of cane per day will cost less than double the cost of one half as large. Such a factory, which is considered the most economical size to work, would cost for machinery and construction from £12,500 to £20,800 according to elaborateness of work.

The great aim is of course to utilise such an expensive structure for as long as possible during the year.

As already pointed out it is possible to considerably extend this season by wise management in date of sowing different varieties.

By establishing a factory, and auxiliary ones at convenient places, it is possible, however, to extend the working season for the central factory to cover nearly the whole year, and to solve the problem of distance within which a field must be located. Such a central factory would cost the amount already quoted, and would have complete machinery for doing regular season's work, and after this is done, for converting syrups of two or three auxiliary factories into sugar. The auxiliary factories, which would cost about half as much, should be established at convenient places, and have machinery for carrying the processes so far as to prepare syrups for the strike-pan. This syrup should be stored in suitable tanks or cisterns, so that it can be worked for sugar at the central factory after the close of the season for handling cane.

The cultivation of sorghum, and the diffusion process for extracting sugar from that plant, are worthy of special attention in our sugar-cane districts, because sorghum crops will assist in extending the harvest for sugar-cane, and also because the diffusion process—which is the only one that will pay to extract sugar from sorghum—is being adopted in the sugar-cane plantations of the United States. A United States Departmental Report of 1888, contains the following:—"It seems to me that the gradual replacement of milling by diffusion process will work a great change in the sugar-industry of the south, bringing success and prosperity, where for years a hard struggle for existence has been going on." Again, in the Annual Report for 1889, it is stated that the quantity of commercial sugar, obtained from sugar-cane by diffusion process, was 30 lb. per ton of cane more than that obtained by milling. At the time of this writing, the report says, the diffusion process has been introduced into five or six of the largest plantations in the state.

Ayuntamiento de Madrid

Notes on Weeds, &c.

THE following information on the purity and vitality of seeds, which has to a great extent, been published by the North Carolina Experiment Station, is especially interesting, since very many of the worst foreign weeds are becoming widely established in this Colony. So much injury has been occasioned by farmers and others failing to recognise new plants, as weeds during their early stages, and therefore not endeavouring to eradicate them, that they are advised to send any new plants found in their fields to the Department to be investigated. A case in illustration of the importance of this course of action, occurred in the Camden district, where a farmer allowed a new plant—which he at first thought to be a valuable plant but which he afterwards found to be the dodder—to obtain possession of his paddocks, and so of the bulk of his profits from them.

The Purity and Vitality of Seeds.—Except in regard to larger sorts of seeds, such as corn, peas, &c. The seeds of field crops are rarely sold entirely free from an admixture of weed seeds; indeed, most of the weeds now so troublesome in our cultivated fields are European plants, which were originally introduced and widely disseminated in packages of imported seeds. While the entire exclusion of weed-seeds from packages of clover, grass, and small grain-seed, is not to be expected, the farmer is justified in demanding that the real worth of the seeds he purchases shall come up to a reasonable standard. The seeds of no two species of plants are exactly alike in size and weight, and, since manufacturers now supply automatic cleaning machinery of very great perfection, there can be no excuse for putting upon the market such seed, as a sample of red-top grass (*Agrostis vulgaris*), which contained 35·50 per cent. of impurities, and of the pure seed only 53 per cent. capable of sprouting; or, in other words there were in the sample only 44·92 per cent. of pure vital, that is to say, valuable seed. Both the grower who endeavours by such means to supply cheap seed, and the farmers and gardeners who purchase seeds at unreasonably low prices, are to be blamed for this. The Consulting Botanist to the Royal Agricultural Society of England says, in one of his reports. "It is impossible to estimate the injury that an agriculturist does to himself, when to save a few shillings in the spring by purchasing inferior seed, he insures at harvest a crop not only poor in itself, but abundantly mixed with seeds of worthless and noxious weeds, whose injury to his crops does not end when they are cut down with the grain. In buying dirty seed he is acquiring material which may prove a serious injury to his crops for years to come." The following standard of purity and vitality of agricultural seeds has been established by that Society:

1. That 95 per cent. by weight of the seed shall be true seeds of the species claimed.
2. That of the pure seed not less than 90 per cent. shall be capable of sprouting in the case of the clovers, the cereals and Timothy grass, of Foxtail grass not less than 20 per cent., and of all other grasses not less than 70 per cent.

Ayuntamiento de Madrid

English seedsmen now guarantee their seeds in accordance with this standard, and in consequence debased seed are rarely found in the English home market. This will be seen from the following extracts from the Annual Report for 1889, of the above mentioned Consulting Botanist, who for a small fee ascertains the purity and germinating power of seeds. "The improvement of seeds has been gradual but always advancing, and the result of this year's work is that deliberate adulteration with cheaper and worthless seed has practically ceased." A similar state of affairs exists in Germany, but there is no check on the quality of the exported seed. The Germans when they undertake to adulterate seed, do it with characteristic perfection. The Carolina Experiment Station has a phial of artistically coloured quartz grains, used by German seedsmen to adulterate clover seed, and detected by the Station in clover seed on sale in the State.

The following method for determining the quality of seeds which is followed by that experiment station, will give an idea of the practice which obtains in nearly all the experiment stations of the United States. The seed is taken from the package in which it reaches the station and thoroughly mixed. A sample of from 1 to 4 grammes (a gramme weighs about 23 English grains), according to the size of the seed, is taken and weighed in a delicate chemical balance. It is next poured into a sectional tin tube, 3½ inches in diameter, and 12 inches long. The bottoms of the section, five in number, are perforated with holes graded from $\frac{1}{12}$th inch in diameter at the top to $\frac{1}{20}$th inch at the bottom. By shaking the tube the mass of seed is separated into several portions. The sticks and coarse impurities are found near the top, while sand and half grown shrivelled seeds fall near the bottom. The bulk of the pure seed is found together. The several portions are then separately spread out on sheets of clean paper, and examined with a microscope. Any good seeds that may have escaped the separator are picked out of the mass of impurities by means of a forceps. Seeds of noxious weeds are carefully looked for, identified and their number noted when practicable. After the true seed have been separated from the impurities the latter are again weighed, and the percentage they bear to the whole calculated.

One hundred true seeds, taken without selection, are next counted out and placed in one of the seed dishes of Nobbe's Seed Sprouting Apparatus. As soon as the seeds have sprouted, they are counted and removed from the dish, and the day and hour noted. When, after several days, no more seeds are found to sprout, or when the unsprouted seeds show signs of decay and become covered with mould, they are counted as dead, and the experiment is completed. The number of seeds which have sprouted, when 100 have been experimented with, indicates the percentage of vitality of the pure seed in the sample. In calculating the worth of a sample of seed, we must consider both the percentage of impurities, and that of vitality of pure seed.

The details of Nobbe's Seed Sprouting Apparatus are as follow:—It consists of porous earthenware pans glazed only on the bottom. They are 8 inches square, and 1½ inch thick. In the centre of each pan is a circular depression ½ inch deep, and 5 inches in diameter. Surrounding this is a ring or fosse 1 inch wide and 1 inch deep. The seeds to be tested are put into the central depression, and water poured into the fosse. The water soon soaks through the porous earthenware, producing a dew-like deposit on the surface of the seed dish. This supplies just enough moisture for most seeds while not enough to drown any. For large seeds, such as beans, corn, &c., the moisture supplied to the seed dishes is not sufficient; but such seeds sprout readily, if of good quality, when placed in the fosse and the water

Ayuntamiento de Madrid

poured in the dish. The whole pan, as described, has a loosely fitting cover, which admits air while excluding light.

The following are some of the principal weeds which have been forwarded to the Department for identification since the last *Gazette* was published:—

Barley Grass (*Hordeum murinum*, Linn.)

A specimen of this grass was received from the Berridale District, where it had become a perfect pest in the lucerne paddocks, completely choking the lucerne, and preventing it from making any growth; in fact, where the lucerne was a bit thin, this grass had assumed possession, and appeared to be spreading rapidly.

This is an annual species of European origin, but now found growing all over the Colony, especially about old stock yards. It attains a height of 12 to 18 inches, and during the winter and early spring months yields a fair amount of succulent herbage, which stock of all kinds will graze upon; but in the early summer months it becomes so hard and wiry, that stock will not touch it. It is not a desirable grass to have in the pastures, for the seeds with adherent awns, often an inch long, are troublesome to the salivary glands of sheep and other small herbivora. It bears seeds prolifically, which ripen in October and November.

The Star Thistle (*Centaurea calcitrapa*, Linn.)

Specimens of this thistle have been received from the Wagga Wagga and Wallendbeen Districts, for the purpose of having it identified and its properties ascertained.

This weed is of European origin, but is spreading in many places in this Colony, much to the concern of both pastoralists and farmers; for though it is only an annual, still it produces—when allowed to grow undisturbed for some time—a large amount of seed, which is so easily disseminated by winds over large areas of land that in a few years the area occupied by it becomes considerably extended. As the numerous sharp spines attached to the flower heads will, on coming in contact with the body, cause sores which it will take some time to heal, farmers should make every endeavour to prevent this plant from spreading, especially into their wheat fields. If action is taken before this thistle becomes fairly established in cultivation paddocks, it can be easily got rid of by cutting it down before it goes to seed, otherwise it will be advisable to put the land in fallow for twelve months, and, during that time, to scarify the land occasionally for the purpose of killing the young plants before they have an opportunity to seed.

The Cockspur Thistle (*Centaurea melitensis*, Linn.)

Specimens of this thistle have been received from many parts of the Colony, but especially from the Mudgee District, where it has already taken possession of hundreds of acres of cultivated land. It is reported to be equally as dangerous as the star thistle.

Pratia erecta (Gaud.)

Specimens of this weed have been received from the Stock Inspector at Forbes, who reports that sheep, when hungry, eat it greedily, but shortly afterwards show signs of poisoning, and die in about 12 hours. The plants

Ayuntamiento de Madrid

forming the tribe in the order *Campanulaceæ*, to which this one belongs, are more or less dangerous on account of their acrid or narcotic properties, whilst three closely allied plants, *Pratia puberula*, Benth., *Lobelia purpurascens*, R. Br., and *Lobelia pratioides*, Benth., found in this Colony, are reported to be poisonous to sheep. This weed abounds in a milky fluid, and has been for some time suspected by the stockmen of the different Colonies of possessing poisonous properties, which are the more likely to cause losses in sheep because this plant offers a tempting bait during summer months when surrounding vegetation is somewhat dry looking. It is a smooth plant with low branching, but sometimes erect stems, from a few inches to a foot long, but usually not more than 6 inches. The leaves, which are half an inch long, are somewhat variable in shape, but are mostly ovate-oblong with serrated edges. The usual places where it is found are banks of rivers and lagoons, or moist places.

Lotus australis (Andr.)

This leguminous plant, which is very common in many parts of the Colony, may be recognised by the leaves being composed of five leaflets, three almost digitate at the end of the stalk, and two close to the stem. Flowers usually pink and fragrant, but varying much in colour, from white to purplish. These are arranged in an umbel at the end of a stalk several inches in length. It is a suspected poisonous plant in many districts, and therefore, one about which the Department will be especially glad to receive information from farmers and graziers who have had experience with it on their holdings. Many leguminous plants have had the character of being poisonous, but under close observation have been found to possess no harmful properties when partaken of with other herbage.

Pimelia linifolia, Sm., *v.* Darling Pea (*Swainsonia galegifolia*, R. Br.)

Mr. Menzies, of Reedy Creek, forwarded an inquiry as to whether, as has been surmised, the *Pimelia linifolia* Sm., is an enemy of the Darling Pea (*Swainsona galegifolia*, R. Br.), and was, in reply, supplied with the following information:—Both these plants are indigenous to New South Wales, and are found growing in various parts of the Colony, sometimes together and sometimes far apart. It is generally admitted that the strongest plants survive when in competition for possession of the soil, but it would be a difficult matter to say which of these two plants is the stronger. On some kinds of soil the Darling Pea will predominate, whilst on other kinds of soil the *Pimelia* will be found more abundant. It is not thought that either of them has the slightest influence in checking the growth of the other. They belong to two widely different orders, and in some measure require different elements to build them up, so that they do not come into actual competition with each other as regards plant food from the soil. The Darling Pea is a Leguminous plant and the *Pimelia* a Thymelaceous one. Both of them produce abundance of seed, but the seeds of the Darling Pea being large, and germinating more easily, would, under some circumstances, become the more aggressive plant; moreover, both these plants will spring up from the roots when the tops are cut off, so that it makes it a difficult matter to exterminate them. Some persons have recommended burning, but experience has proved that after a fire these plants spring up more vigorously than before. The only effectual way to clear pastures of these plants is to grub

Ayuntamiento de Madrid

them up and burn them. This, of course, becomes expensive, and in some places would be impracticable, on account of the very large areas overrun with the plants. Regarding the properties of the *Pimelia linifolia*, Sm., as a fodder, the plant has never been looked on with favour in this direction, and it is said to "rob the ground of its fertility and prevent the growth of grass." Two species of *Pimelia*, *P. Pauciflora*, R. Br., and *P. simplex*, F. v. M., are suspected poison plants, but have not been analysed.

With regard to the conflicting statements which have been made as to the Darling Pea, Mr. J. B. Bettington, of Brinley Park, Merriwa, writes, "I do not regard it as such a scourge as some do, and I do not think that healthy sheep eat it (salt is an antidote to it), or if they do they will not suffer any ill effects from it. I have killed many sheep suffering from what is popularly called "Pea-eating," and have always found them full of worms, but whether the worms are caused by eating the pea, or the worms in the sheep cause them to eat the pea, I cannot say."

The Director would be glad to receive from time to time details of the experience of those interested, in reference to the effects of the Darling Pea upon stock.

Pimelia curviflora (R. Br.)

A plant forwarded to the Department by Dr. Ramsay, of the Australian Museum, has been identified as *Pimelia curviflora*, R. Br. One of the physiological properties of the order *Thymeleæ*, to which the *Pimelia* belongs, is the causticity of the bark, which acts on the skin as a vesicatory, and causes excessive pain in the mouth when chewed.

Dodder (*Cuscuta epithymum*, Willd.)

In view of the large number of specimens of the dodder pest which have been forwarded to the Department from many districts of the Colony, it is essential that our farmers, who may find it in the lucerne or clover paddocks, should take immediate steps to eradicate it. Any little spots they first notice will soon spread, and if not checked, will eventually destroy the whole crop. The first step towards eradication is to carefully cut the dodder spot, and burn the whole of the cutting. The spots thus cleared should then be syringed, by means of the finest spray pump available, with a solution of sulphate of iron—1 lb. to 8 gals. of water. This will kill the stems of the dodder, and will also act as a manure to the lucerne or clover, stimulating new growth and increasing the amount of chlorophyl in the leaves, thus making the young plants assume a bright glossy green. This chemical is very valuable also as a cure for mossy patches in grass paddocks, for rusty peach, nectarine and plum trees, as also for oranges and lemons, which show signs of needing a stimulant. It can be obtained from Messrs. Elliott Bros., O'Connell-street, Sydney, at £10 per ton.

Gypsophila perfoliata (Linn.)

A specimen recently forwarded to the Department for identification by Mr. Coleman, of Bega, has been recognised as *Gypsophila Perfoliata*, a native of Spain. It is an annual plant, and has been cultivated in British gardens, but is of too weedy a nature to occupy a prominent place in any garden. It produces, when left undisturbed, such an enormous quantity of seed, that in a genial climate like that of New South Wales, it would be

Ayuntamiento de Madrid

likely to become a serious pest in cultivated ground. Farmers, therefore, should not hesitate to destroy it. Like many other introduced annual plants it will, in favourable seasons, produce more than one crop of seeds. It grows to a height of about 2 feet, bears a black seed, and shows a decided preference for a limestone soil.

Sorrel (*Runex acetosella*, Linn.)

An inquiry having been received by the Department from Mr. John Murray, of Athol, via Toogong, the information forwarded to that gentleman will doubtless be of use to those engaged in agricultural or pastoral pursuits in other parts of the Colony: Sorrel is one of the worst weeds ever introduced into Australia, and it has been the subject of great comment by farmers, orchardists, and gardeners, who have suggested many remedies, but none of them have been of much use. It is not only propagated freely by seed, but the smallest particle of root will produce a plant in a very short time, so that it becomes twice as difficult to eradicate as any other weed pest. It is not of the slightest use to scarify the ground *occasionally*, because this only severs the roots and propogates the plant. The only remedy that can be suggested is to *persistently* cultivate the ground where it is growing, especially in hot weather, with a light scarifier, which will turn up the roots to the sun, and, of course, kill them. Horses that feed on pastures where sorrel is growing should not be taken on to cultivated ground, neither should those fed on hay, saved from such pastures, as the seeds will germinate after passing through the intestines. Very many places under cultivation in this and the other Colonies are now infested with Sorrel, the introduction of which can be traced to manure brought from a distance, or from strange horses being allowed to come upon the ground. Sorrel is not the only pest which has been introduced to cultivated ground by such means, and farmers should, therefore, be exceedingly careful upon these apparently slight matters.

Ayuntamiento de Madrid

The Germination of the Walnut.

FREQUENT complaints are heard as to the difficulty of growing walnut trees from the nut, and also of the number of failures which occur, and various reasons are assigned for their unsuccessful germination and ultimate decay in the ground. It is commonly supposed by persons who examine the decaying nuts and find larvæ or small beetles in them, that these are the cause of the failure of germination. In reality, however, these small insects are only the consequence of the decaying condition. Most of the beetles found in the nuts belong to the family Cryptophagidæ and Mycetophagidæ, which live, both in the larval and perfect state, upon the fungoid growth of decaying vegetable matter, and are quite unable to enter the nut when it is in a sound and hard condition. Neither can others which belong to the Staphylinidæ, which may be found in the nut when the kernel gets quite rotten, and is in a soft or smeary condition. When the nut is rotten the grey isopod crustacean, commonly called "Wood louse," may also be found about them, as well as centipedes; but none of these are able to enter the nut when sound, and when present are probably pursuing invaders rather than eating the kernel.

The cause of only a small percentage of the nuts germinating is that they get attacked by blue mould, and are thus destroyed, and the reason of this is to be found in the careless and unnatural way in which they are generally planted. As the walnut takes a very long time to germinate, it stands to reason that the planting of them must be attended to with some care to insure success, and that the ground be in such a condition that no excessive moisture causes them to get diseased before germination takes place. It is also necessary that well developed nuts should be chosen for planting. A well-formed nut, properly planted, will almost always produce a healthy plant and the readiest germination. The ground for planting requires to be well drained, porous, and of a warm nature. A moderately sandy loam is the best soil. The soil should be dug to a depth of 24 inches at the least, and well worked. The nuts should not be placed more than an inch below the surface, and they should be covered with loose soil. It is very important that the outer covering of the shell should be planted with the nut. This not only tends to prevent mould attacking the kernel during the lengthy period required for germination, but also furnishes the first and natural nourishment to the young plant. By carefully following this procedure no less than 80 per cent. of trees have been obtained, while from nuts planted without the protecting cover probably not 10 per cent. will grow, particularly if the ground is wet and cold.

Unless the trees are to remain where reared from the nut it is necessary to transplant them early, the best time being when the trees are about two years old. Of course the time of transplanting will depend greatly upon the more or less vigorous growth of the young trees, but as the walnut developes an enormous tap-root early transplanting is necessary. This operation should be very carefully performed, and if the young trees are likely to remain long in the nursery it is necessary to transplant them more than once in order to encourage the growth of lateral roots.

Ayuntamiento de Madrid

Increasing Gluten in Wheat.

With a view of ascertaining the best way to increase the amount of gluten in wheat a number of exhaustive experiments have been made by Mons. Gatelier, the President of the Agricultural Society of Meaux (France). The experiments consisted in sowing white Victoria wheat in various plots of sandy soil, each similarly manured, under three different conditions, viz.: (1) after sugar beet, (2) after a late clearing of lucerne, and (3) after hop trefoil (*Medicago lupulina*), with farm-yard manure, about 30,000 kilogrammes (66,000 lb.) to the hectare (2·47 acres), equivalent to a dressing of 26,000 lb., or about 11½ tons per acre. The results were that the flour of wheat after beet was found on analysis to contain 9·06 per cent. of dry gluten; that after lucerne 10·06 per cent.; and that after hop trefoil and manure 10·50 per cent. The grain which followed the beetroot was considerably the best in appearance, but though this was the case it contained the least amount of gluten. As beet-root takes from the soil more nitrogen than either of the other preceding crops the conclusion is arrived at, that after lucerne and hop-trefoil there remains more assimilable nitrogen in the soil, which richness of nitrogen results in increasing the gluten in wheat grown under such conditions.

A second and more exhaustive experiment with Victoria wheat and nitrogenous manure resulted as follows:—

Manures used to the Hectare—(nearly 2½ acres).	Proportion of Nitrogen to Phosphoric acid in the Manure.	Dry Gluten.
220 lb. Sulphate of Ammonia	4	10·43
660 ,, Superphosphate	9	
440 ,, Sulphate of Ammonia	8	11·37
660 ,, Superphosphate	9	
660 ,, Sulphate of Ammonia	12	12·75
660 ,, Superphosphate	9	
660 ,, Sulphate of Ammonia	6	11·31
1320 ,, Superphosphate	9	

These results seem to prove that it is possible to increase by cultivation the richness of gluten in wheat, and that it depends upon the proportion of nitrogen in relation to phosphoric acid in the manure.

An investigation to ascertain the kinds of wheat which contained most gluten revealed the fact that out of eleven varieties of autumn wheats there was a diversity of 2·44 per cent. found between the Poulard of Australia with 9·56 per cent. of gluten—the poorest—and Crépy wheat with 12 per cent. of gluten. The above experiments show that the quantity of gluten in wheat depends upon the kind of manure used and the kind of wheat sown. There is one other point in regard to the amount of gluten contained in this cereal

Ayuntamiento de Madrid

—the period of cutting—and the result of an experiment in this direction is shown by the following table:—

	Richness in Gluten.
Roseau wheat, cut July 22nd, 1888	13·12
Same wheat, cut August 5th, 1888	11·50
Roseau wheat, cut July 2nd, 1889	14·31
Same wheat, cut July 18th, 1889...	12·50

This shows that wheat is richer in gluten when cut before it is fully matured. Care, however, must be taken not to cut it too early, and the proper time would appear to be as soon as the red or white colour of the grain is recognisable, showing that the skin is formed, but the wheat must be left in the sheaves until fully matured. Finally, it will be seen that the production of wheat rich in gluten is not incompatible with the small proportion of bran that miller's prefer.

Ayuntamiento de Madrid

The Manufacture of Perfumes.

(Report by British Consul Harris, of Nice, France.)

In connection with the interest lately taken in the manufacture of scent from Australian flowers, the following account of the processes for manufacture of perfumes in France will be of practical value :—

The art of producing scent, which is well understood at Nice, can only be acquired by long practice, by which alone the blending of the primary essences in proper proportions becomes thoroughly understood.

The first process is the extraction of the essences by distillation. A large copper vessel or alembic is filled with water to about two-thirds of its capacity ; the flowers to be treated are then introduced, and it is hermetically closed. It is then placed on a fire ; usually, in our days, gas or steam is used for this purpose. Steam is generated by this means in the cylinder, and is carried by means of a pipe into a second cylinder, which is constantly kept replenished with cold water, and is furnished with an overflow cock. The pipe, in its passage through this second cylinder, assumes the form of a spiral coil. This coil ends in a cock at the bottom of the cylinder, from which the volatile essence exudes drop by drop as the steam becomes condensed in its passage through the spiral coil.

In this manner the essence is collected in a small glass vessel, while at the same time the water containing a small portion of the scent, and which still remains in the alembic aforesaid, is itself perfumed, and becomes the rose water or orange flower water of trade.

All flowers are not susceptible of this treatment—some of them, such as jessamine, violet, cassie, tuberose, &c., containing no essence, have to be treated by a different process, which will be presently described.

Of the flowers producing essences the orange flower produces but 1 gramme of essence for 1 kilo. of flowers, or but one-thousandth part. This essence is styled "neroli," and is the principal essence produced in the district between the Var and the Italian frontier.

The following table will show the proportionate yield of the different flowers :—

Neroli...	1,000	lb.	of flowers	1 lb.	of essence.
Rose	25,000	„	„	1	„
Geranium	1,000	„	„	1	„
Mint	1,000	„	„	0·750	„
Orange leaf (bitter) ...	1,000	„	„	1	„
Lavender	100	„	„	0·500	„
Eucalyptus	100	„	„	0·500	„

The volatile essences thus obtained, combined and mixed together with a certain quantity of alcohol, are used in the preparation and as the basis of Eau de Cologne, toilet vinegar, lavender water, &c.

Ayuntamiento de Madrid

There are two processes used for the purpose of extracting perfume from flowers which do not contain the volatile essence.

The first may be described as the cold process, and the second as the hot process.

The former is generally used for cassie (*Acacia Farneriana*), jessamine, jonquils, tuberoses, violets, and some other flowers.

Freshly-gathered flowers are placed upon a layer of pure lard, a quarter of an inch in thickness, spread over a sheet of glass about 2 feet square, which is framed in wood and forms a kind of tray. These trays, sometimes some forty or fifty together, are then piled upon one another. The flowers are changed every twelve, eighteen, or twenty-four hours, according to circumstances, and the process is thus continued until the lard is sufficiently charged with perfume. Jessamine and tuberose are frequently changed as often as fifty times before the lard is considered to be sufficiently impregnated, cassie and violets from thirty to forty times, and jonquils about twenty times only.

The fat thus obtained can be packed in air-tight tins and conveyed anywhere, and it used to be thus exported in considerable quantities to Rimmel's, in London, from their garden at Nice.

When the hot process is resorted to for the purpose of obtaining the impregnated fat, 20 lb. of grease are placed in a copper vessel, together with some 5 lb. of flowers. The vessel is then placed over a slow fire, and the contents are well stirred. After allowing the compound to boil for ten minutes the vessel is left to cool for some hours. An additional 5 lb. of flowers are then added, and the process is repeated until the fat has absorbed the requisite amount of perfume. The hot liquid is then poured through a sieve, and the greasy flower-paste that remains is subjected to hydraulic pressure. It is in these two ways that the "pomades' of trade are produced.

From these "pomades," perfumed and alcoholised liquids are extracted by means of grain spirit, and also by spirits of wine. These are the "extracts" of trade, and it is by the judicious blending of the different essences and concentrated perfumes, obtained by the processes above described, that the numerous scents are produced. The machinery used in their production is very simple.

There are certain perfumes which can only be obtained, however, by fermentation of certain fruits, flowers, and roots, with alcohol; of this nature are benzoin (tonquin beans), iris, and others which are of great use in the manufacture of scents.

Ayuntamiento de Madrid

Analyses of Commercial Fertilizers, &c.

Megass Ash.

It may not, perhaps, be generally known that megass, the refuse after sugar-cane has gone through the squeezing process at the mill, is used as fuel for the furnaces, and this Department being desirous of estimating the value of the ashes as a fertilizer, applied to the manager of the Colonial Sugar Refining Company, Mr. C. U. Stephens, at Harewood Mills, Clarence River, who courteously complied by sending a parcel fresh from the furnace. The following is the result of an analysis by Dr. Helms, the Departmental Analyst.

Lime	1·112 per cent.
Potash	4·795 ,,
Phosphoric acid ($P^2 O^5$)	0·281 ,,
Magnesia	0·7225 ,,

Two points are to be noted in connection with this analysis:—1. The large percentage of potash taken from the soil by the sugar-cane, and lost to the farmer unless returned in the form of manure, or in the ashes of the megass; 2. The consequently great commercial value of these ashes. At the Sydney prices for potash manures they would be worth at least 25s. per ton, but at the local price, with freight and other charges added, they should be worth much more. An important point in connection with the use of megass ash for manuring purposes is that they should be applied at once when quite fresh from the furnace, as the potash they contain, being soluble, is rapidly leached out of the ash heap by rain.

The following analysis of ashes of megass made in Guadeloupe (West Indies), will be interesting in comparing sugar-growing soils of different countries:—

	Minimum.	Maximum.	Mean.
Phosphoric acid	3·08	7·12	4·96
Sulphuric acid	1·96	5·53	3·52
Chlorine	0·15	0·62	0·34
Lime	4·39	9·33	8·20
Magnesia	3·46	7·93	5·60
Potash	4·73	10·93	7·03
Soda	0·25	2·45	1·09
Ferrie oxide	0·98	2·51	1·84
Silica	62·14	72·73	67·42
			100·00

The average per centage of ashes and mineral constituents in the sugar-cane is about 0·35 per cent., of which about 0·20 per cent. remains in the megass, equal to 57 per cent. of total mineral matters, the remaining 0·15 per cent. is wasted away with the juice.

Ayuntamiento de Madrid

Although the saline matters contained in the megass are only a fraction of the total mineral matters in the sugar-cane, it is important that they should be restored to the soil. The use of the megass as fuel for the boilers involves the loss of the nitrogen and organic matters it contains, but the remaining ashes are very valuable fertilizers.

The analysis given by Dr. Helms seems to point to a marked deficiency, especially in phosphoric acid and in lime, in the soil under canes on the Clarence River. Besides, so far as potash is concerned, it is hardly possible to compare the ashes from megass used as fuel under a boiler where the temperature is very intense, and hence the potash likely to volatilize, with the ashes burnt with much care at a gentle heat in a laboratory.

The analysis of the ashes of megass from Guadeloupe would point to a greater state of fertility of the soil in that country.

Ayuntamiento de Madrid

What Does a Ton of Cheese Cost the Soil?

THE following table shows the relative amounts of the most valuable constituents which are removed from the soil by the different products of the dairy:—

	Nitrogen.	Phosphoric acid.	Potash.
	lb.	lb.	lb.
Milk	12·02	4·50	2·55
Cream	10·55	1·68	1·06
Skim-milk	12 39	5·07	2·85
Butter-milk	10·82	1·73	0·11
Whey	2·72	1·84	5·67
Butter	2·70	1·58	1·00
Cheese	112·00	17·85	2·15

The value of the above constituents for every one ton of each product is as follows:—

	Nitrogen.	Phosphoric acid.	Potash.	Total.
	£ s. d.	s. d.	s. d.	£ s. d.
Milk	0 7 6	0 11	0 10	0 9 3
Cream	0 6 7	0 4	0 4	0 7 3
Skim-milk	0 7 9	1 0½	0 11	0 9 8½
Butter-milk	0 6 8	0 4½	0 0½	0 7 1
Whey	0 1 8	0 4½	1 10½	0 3 11
Butter	0 1 8	0 4	0 4	0 2 4
Cheese	3 10 0	3 11	0 8½	3 14 7½

In other words this means that every ton of cheese taken off the dairy farm impoverishes the soil to the extent of £3 14s. 7½d., and therefore to keep the soil in its natural state of fertility the farmer should add appropriate manures representing the above-mentioned weights of the different constituents to the value of £3 14s. 7½d. If this be not done, either the ground will gradually become exhausted, or, what is equally to be guarded against, an inferior class of grasses will thrive at the expense of the more valuable (because more nutritious) grasses, and will ultimately exterminate them.

Ayuntamiento de Madrid

Frosts.

THE period at which frosts are likely to occur is a matter of vital importance to fruit-growers and vignerons, more especially in the case of one who is about to embark his capital either in laying down an orchard or a vineyard. As a rule a "table" is not enticing to the reader, but, for the above reasons, that which is appended is one which demands the most careful perusal. This table has been prepared at the Sydney Observatory from the reports from time to time received from the meteorological stations throughout the Colony, and furnished by the courtesy of Mr. H. C. Russell, B.A., F.R.A.S., Government Astronomer, to the Minister of Mines and Agriculture. There will doubtless be found residents in some districts whose personal experience goes to show that frosts have occurred later than is set down in the table. This experience the Department is most anxious to receive and cordially invites it, not because there is any idea that the statements of the Government Astronomer are incorrect, but because it is quite possible that frosts may occur in one part of a district much later than in another from the mere accident of situation or aspect. It is in view of the certain extension of the fruit-growing industry that the question of late frosts becomes peculiarly important, necessitating the most careful consideration in selecting a site for an orchard or vineyard, especially in the inland districts. As a rule the frosts are less felt with a northerly or easterly aspect and in sheltered valleys; while the other side of a slope facing the south and west may be subject to extremely late frosts. It must not be forgotten that a late frost will absolutely destroy a most promising crop of fruit and nip off tender young shoots which have been deluded into exposing themselves by the genial warmth of the springtide sun. Nor is it fruit alone to which these disasters occur; sugar-cane is often a severe sufferer as also are vines and potatoes. The Department in presenting the subjoined table is desirous of giving prominence to this matter, and of obtaining the most complete additional information for the benefit of the whole Colony. The fact must not be overlooked that while experienced fruit-growers in different districts have a fair general knowledge of the season at which frosts may be expected in their respective districts, a detailed list covering the whole Colony must of necessity contain information which has hitherto not been available. As has previously been stated the Department is most anxious to receive communications on this subject from readers of the *Gazette* with a view to publishing a more detailed and complete table.

Ayuntamiento de Madrid

METEOROLOGICAL Observations from Records kept at Sydney Observatory.

Frosts.

Stations.	Commence.	End.	Earliest.	Latest.
Albury	May	Middle of August...	7 April, 1860	21 Sept., 1860
Antony ...	Beginning of June...	Middle of August...	16 May, 1882	20 Aug., 1888
Armidale ...	Latter part of April	Middle of September	7 April, 1862	21 Dec., 1858
Bathurst ...	Beginning of May...	Beginning of Sept...	8 Feb., 1864	24 Oct., 1859
Bega	Middle of May ...	Middle of August ..	7 May, 1879	24 Aug., 1883
Bourke... ...	Early in June ...	Latter part of July and beginning of August.	6 June, 1872 1881	2 Sept., 1889
Casino	June...	July...	Particulars meagre.	
Carcoar ...	Middle of April ...	Middle of October...	9 Mar., 1881	30 Oct., 1888
Cooma	Middle of April ...	Beginning of Nov...	3 ,, 1871	26 Nov., 1859
Coonabarabran..	Latter part of April	Middle of October...	19 ,, 1888	31 Oct., 1883
Cowra	Middle of May ...	Middle of August...	3 May, 1886	26 Sept., 1885
Crookwell ...	Latter part of March	Latter part of Oct..	15 Mar., 1886	30 Nov., 1885
Dubbo	Beginning of May...	Middle of August...	14 ,, 1885	11 Sept., 1875
Douglas (Lake George.)	Middle of June ...	Middle of September	1 June, 1886	30 ,, 1886
Eden	No frosts at lighthouse.			
Forbes	Middle of June ...	August	25 May, 1874	† Sept., 1884
Glen Innes ...	Beginning of May .	Middle of August...	10 April, 1883	30 ,, 1885
Gosford ...	No frosts except in 1883, July 18th and August 4th.			
Goulburn ...	Middle of May ...	Latter part of Aug.	21 Mar., 1871	3 Oct., 1864
Grafton ...	June...	July...	14 May, 1887	18 Aug., 1886
Gulgong ...	May...	September	6 ,, 1887	6 Oct., 1886
Gundaroo ...	Beginning of May...	Latter part of Sept.	3 April, 1881	27 Nov., 1879
Gunnedah ..	Middle of June ...	Latter part of July	29 May, 1877	12 Sept., 1889
Guyra	Beginning of May...	Middle of October...	15 April, 1888	27 Nov., 1886
Hay	Middle of June ...	Latter part of July	21 May, 1884	10 Aug., 1882
Inverell ...	Latter part of May	Middle of September	23 April, 1886	13 Oct., 1885
Kiandra ...	Frosts every month.			
Lismore ...	June	July...	Particulars meagre.	
Maitland ...	Latter part of May	Latter part of July	2 May, 1860	16 Sept., 1860
Milton	Beginning of June...	Beginning of August	25 ,, 1877	6 ,, 1881
Molong ...	Middle of May ...	Middle of September	5 ,, 1886	28 ,, 1887
Moruya Heads..	Frosts during July, very light.			
Moss Vale ...	Beginning of May...	Middle of September	14 April, 1879 1888	21 Oct., 1888
Mudgee ...	Middle of May ...	Middle of September	13 ,, 1878	22 Sept., 1883
Murrumburrah .	June...	August	20 ,, *1887	24 Aug., 1889
Murrurundi ...	June...	August	6 May, 1888	28 Sept., 1887
Muswellbrook ..	June...	August	7 ,, 1888	9 ,, 1882
Narrabri ...	May...	Beginning of Sept...	8 ,, 1875	30 ,, 1874
Narrandera ...	June...	August	3 ,, 1886	3 ,, 1889
Orange... ...	Middle of April ...	October	19 Mar., 1888	2 Nov., 1882
Picton	May...	September	24 April, 1888	14 Oct., 1887
Nowendoc ...	April	October	15 Mar., 1886	28 ,, 1886
Port Macquarie.	Frosts recorded only in 1874, 1880, 1888, June and July, very light.			
Queanbeyan ...	End of April ...	September	13 April, 1875	6 Nov., 1871
Quirindi ...	May...	August	21 ,, 1887	19 Sept., 1884
Singleton ...	June...	July...	Particulars meagre.	
Scone	June...	August	8 May, 1874	23 Sept., 1874
Tabulam ...	No frosts.			
Tamworth ...	May...	September	24 April, 1886	29 Sept., 1884
Tenterfield ...	May...	Beginning of Sept...	1 May, 1879	13 ,, 1889
Urana	May...	Middle of August...	6 ,, 1879	21 Aug., 1879
Wagga Wagga..	May...	August	3 ,, 1879	7 Sept., 1881
Wentworth ...	June...	August	15 ,, 1876	31 Aug., 1876
Wollongong ...	June 25th, 1877, only frost recorded.			
Young	May...	August	20 April, 1887	25 Sept., 1886

* Very light. † No date given.

Ayuntamiento de Madrid

Notes on Diseases of Plants.

By N. A. COBB.

Bitter-Rot of the Apple (*Glœosporium versicolor*).

The attention of the pathological branch of the Department of Agriculture was first called to this disease by Mr. Scobie, M.L.A., who has forwarded a number of specimens at different times. Specimens have also been received from several other parties resident in different parts of the Colony. The disease does not attack all varieties of apples, certain sorts being comparatively free from it, others being slightly attacked, and others, again, being so subject to it that the entire crop is uniformly a failure. This disease appears about the time the fruit begins to ripen. The first symptom is the appearance somewhere on the surface of the apple of a small circular brown spot. The spot rapidly enlarges, and assumes various shades of brown, the different shades appearing in concentric rings. After four or five days small pustules make their appearance on the brown spot, and these also are arranged concentrically When the spot has reached a diameter of one quarter of an inch, the pustules burst and give exit to a light salmon-coloured mass, composed entirely of the spores of the fungus *Glœosporium versicolor*, which is the cause of the disease. The pustules of a single spot at this stage contain several hundred thousand spores, and a little later the number increases to several millions; for the diseased spot keeps on increasing in size, throwing up ring after ring of pustules, until the whole apple becomes brown and rotten, the entire process requiring about a fortnight for completion. The disease has acquired the name "bitter-rot" from the taste of the resulting rot. Experiments have been made at the pathological branch showing that this disease can be easily propagated on other fruits. A sterilised needle bearing a few bitter-rot spores is thrust through the skin of a peach, plum, nectarine, pear, cherry, or mango, and after five days, from the invisible puncture thus made, a diseased spot appears which passes through all the stages just described as occurring in the case of the apple. The pathologist has also observed the disease occurring naturally on the peach and mango. These experiments throw light on the important subject of

How to treat the Disease.

In the first place it is necessary, in order to check the disease, to give heed to what becomes of the rotten fruit. If every rotten apple has on its surface several million spores, each capable of generating the disease, it behoves the orchardist suffering from bitter rot, if he is desirous of saving his future crops, to take good care that such apples are destroyed. They should not be allowed to lie and rot to pieces on the ground; they should be

Ayuntamiento de Madrid

raked together and burned or buried. If these apples be not so destroyed, the next crop is sure to suffer from the rot. The pathologist cites the case of an orchard of Early Harvest apples, where the whole crop when nearly ripe uniformly succumbed to this disease. The owner allowed the apples to decay under the trees, "so as to fertilise the ground." Year after year the crop, "by a dispensation of Providence," was a total failure. Removing all the rotten apples as fast as they fell during one season very perceptibly decreased the disease the next season. The second season the trees were sprayed with ammonio-carbonate of copper, and after that the crop was one which reminded the owner of old times, when his fruits were free from the disease.

Ammonio-carbonate of copper is made as follows:—To 1 quart of aqua ammonia (22° Baumé) add 3 oz. carbonate of copper. Shake until a clear solution is produced, then dilute with 22 gallons of water.

Commencing before the fruit begins to ripen (say early in December), apply the spray three times, at intervals of ten days or two weeks. All parts of the fruit, especially the blossom end, must be thoroughly sprayed. With the proper apparatus the cost per tree need not exceed 1d. for each application, *i.e.*, 3d. for the season, provided as many as 100 trees are to be treated.

It is hoped, with the aid of the description given, orchardists will be able to at once recognise the disease; and it is desired that they should report to the Director of Agriculture what varieties they find to be most subject to the bitter-rot. From data thus collected the Department will be able to publish in the *Agricultural Gazette* a list of rot-proof varieties suitable for our orchards.

Pear Mite.

Mr. W. Affleck, of Gundaroo, forwarded to the Department, in January last, a piece of diseased branch cut from a pear-tree. He explained that the tree was more seriously affected this year than ever before, and that nearly all the new timber had died down to the point at which the tree was pruned at the last pruning season. The trees were found to be attacked by two species of fungi, viz., *Fusciladium pyrinum* and a *Macrosporium*, and also by the pear mite (*Phytoptus pyri, Sorauer*). The effect produced by the pear mite is very similar in appearance to that produced by *Fusicladium*, or pear scab; and it would be very easy to mistake one of these diseases for the other unless they were observed carefully. This is a matter of importance, as the remedies are quite different. Eau celeste, or something similar, which would be quite the thing for *Fusicladium*, would have little effect upon the pear mite. The diseases are, however, readily distinguished if carefully examined. While they both produce a scabby appearance, especially on the leaves, the effects of the mite have the appearance of blisters; and if these blisters are examined with a magnifying glass it will be seen that some of them, and in some cases many of them, have a perforation through which the mites go in and out. The scabs in *Fusicladium* are not due to a mite, and are therefore not perforated. *Fusicladium pyrinum* may be almost entirely prevented at a slight cost by spraying, once in two or three weeks during the spring and summer, with the mixture known as eau celeste (modified):—

(1.) Dissolve 2 lb. of copper sulphate (bluestone) in hot water.
(2.) Dissolve 2 lb. of sodium carbonate in another vessel of water.

Mix 1 and 2, and before using add 1½ pints of ammonia, and then dilute to 30 gallons with water. The second named fungus was considered to be accidental, and to have, probably, come from the weeds with which the

Ayuntamiento de Madrid

pear-twig was packed. The pear mite was undoubtedly the main trouble. Two remedies have been successfully applied to mites of other fruit-trees and vines, and were recommended for trial in the present case. These remedies are—

(*a*) Spray of 2½ per cent. solution of whale-oil soap, made and applied as follows :—Dissolve 1 lb. soap in 40 lb. water, and apply with a spraying-machine to the early spring foliage. Repeat this two or three times at intervals of ten days or two weeks.
(*b*) Flowers of sulphur at intervals of a fortnight.

Mr. Affleck was warned that no such remedies had been tried on the pear mite, and that he had better proceed with caution and apply the remedies in the first instance to a few branches to find out the effect on the foliage. He was also asked to report the result of the experiment to the Department, and the report when received, will be duly made known.

Linseed Plant attacked by Fungoid Growth.

Out of two samples of linseed, the one Calcutta and the other New Zealand, sent by the Department to Mr. G. Clout, of Brungle, one—the Calcutta—is reported to have become seriously affected with a red fungoid growth. A specimen of the diseased plant has been received from Mr. Clout for investigation, and the Pathologist reports that little is at present known of the disease, which is very prevalent in India and other countries, where it caused great damage to the linseed crops. The disease is caused by *Melampsora lini*, and is being thoroughly investigated by the Department, and will be illustrated in the coming numbers of the *Gazette*.

Peach Rust.

Mr. H. P. Stivens, of Barrellan, forwarded in February last specimens of the leaves of peach trees in his orchard which were diseased, asking for information as to the nature of the disease and its cure. He stated that the trees were 2 years old, most of them growing vigorously in clay soil, trenched 2 feet deep and pretty well drained. The fungus—with which the leaves were affected—was that known to pathologists as peach rust, for which the following remedies can at present be recommended :—

(1.) Collecting and burning affected leaves where practicable. This is very important in a peach orchard, but does not matter so much if the trees are isolated.
(2.) Spraying the trees in winter with solution of sulphate of iron in the proportion of 1 lb. to 8 gallons.
(3.) The application of potash manures, vigorous growth in the trees being considered one of the best preventives of damage from peach rust.

This disease should not be called "yellows," inasmuch as "yellows" is now believed to be caused by bacteria. All known fungicides which are effectual are more or less injurious to peach-trees, and therefore it would be unwise to experiment with any of them. This information was also forwarded to Mr. Peckham, of Guildford, whose trees were similarly affected, and to Mr. G. H. Willis, of Corowa.

Ayuntamiento de Madrid

Entomological Notes.

By A. SIDNEY OLLIFF.

Paris Green as a Remedy for Codling Moth.

Various correspondents have written during the past three months giving accounts of successful applications of Paris green as a remedy for the codling moth. Mr. J. D. Robertson, Bowning, gives some interesting particulars, which it may be well to quote. He says:—"Some time ago I promised to let you know how I succeeded with my experiments in spraying apples with Paris green solution for codling moth. The first spraying was done on October 27th, with 1 lb. of green to 150 gallons of water. Second spraying on November 1st in same quantity. Third spraying on November 12th, with 1 lb. of green to 180 or 200 gallons of water. The solution was applied thoroughly with an old garden engine, fitted up by myself, and I can say it did the work in every way more satisfactorily than a force pump that cost me £4 10s. I had a 50-gallon cask on a cart, and a pump provided with a yard of hose, and a four feet ¾ inch tin pipe and rose, fitted in an oil drum. I mixed the solution in the cask, and a man drove the cart and filled the drum, while I sprayed half a tree on each side of the vehicle. I directed the hose with one hand and pumped with the other. When we reached the end of the rows we turned round to the next row, doing three hundred trees a day at a cost of about three shillings for Paris green. By having the four feet of tin pipe I could direct the spray to any part of the tree on one side without moving the cart."

The Potato Moth (*Lita solanella*, Boisd.)

Mr. A. Bragg, Cullinga, and Mr. T. B. Linley, Canley Vale, have forwarded potatoes infested with the larvæ or grubs of the potato moth (*Lita solanella*), one of the most destructive of the pests that affect that vegetable. This pest has frequently occurred in vast numbers in New South Wales and all the other colonies and is probably the worst enemy of the potato-grower. It is a curious fact that the insect has sometimes been found to confine its attacks to stored tubers, while at other times it attacks the growing as well as the stored potatoes.

With regard to remedies it may be said that these must be solely of a preventive character. Stored tubers should be separated at once from tubers that exhibit signs of the insects' presence, and the latter destroyed. If the presence of the insect is suspected the potatoes should be housed immediately, and the store-house should be kept as clean as possible. It has been suggested that previous to storing, the tubers should be washed in some solution distasteful to the moths and their larvæ. For this purpose weak salt, sulphuric acid solution, and alum, have been suggested.

Ayuntamiento de Madrid

A detailed life-history of the insect, accompanied by drawings from specimens forwarded from Bowning by Mr. T. Robertson some time since, will be published in a future number of the *Gazette*.

Brown Scale on Peaches.

Mr. W. Selkirk, Watson's Bay, sends some peaches affected with fungi and scale-insects. Upon a careful examination of the fruit it became evident that the true cause of its discoloration and decay was due to the presence of the scale-insect (*Leucanium hemisphæricum*), commonly called brown scale. With regard to the fungi, of which there were several, they follow on the attack of the insects, living on fluid secreted by them, and on the juice of the fruit which the punctures of the insects have caused to flow. It follows, therefore, that if the scale-insects are got rid of, the fungi must of necessity disappear. For this purpose the following well-known recipe is recommended:—Common soap, ½ lb.; kerosene, 2 gallons; soft water, 1 gallon. Dissolve the soap in the water heated to boiling, then add the kerosene, and churn the mixture until a creamy fluid results which thickens on cooling; dilute with 9 or 10 times the quantity of water. The quantities given above will make about thirty gallons of liquid. Whale-oil soap, soft-soap, or any other kind will do. Apply either with a spraying machine or with a fine syringe. It may be necessary to make more than one application

Ayuntamiento de Madrid

General Notes.

The Strawsoniser.

This machine is an invention of very recent date. It has been designed (1st) for distributing liquids or insect powders in the very finest form, and (2nd) for broadcasting seeds and fine chemical manures. The makers assert that the machine will distribute nitrates, lime, super-phosphates, soot, sulphate of ammonia, and such like manures in quantities as small as 28lb. per acre, and will distribute liquids in a spray so fine that one gallon will cover an acre. After a recent trial at the Queen's Flemish Farm at Windsor, the steward thus reported upon it:—"A liquid insecticide was distributed over the farm at the rate of two gallons per acre, and every square inch of it appears to have come under the action of the sprinkler. By a different machine being used from that which distributed the insecticide, barley was sown over a width of 18 feet at the rate of three bushels per acre; some 30 or 40 acres can be sown in a day."

The strawsoniser has two sprinklers, and is worked by a fan attached to the axle, which is ingeniously made to give 155 revolutions while the wheel of the machine performs one. When led over a field at its average speed of three miles an hour, the fan turns at the rate of 3,250 revolutions per minute. This creates a blast of air which, when led by the pipes into the sprinklers, mingles with the liquid or powder and distributes it with remarkable equality over a very large area. The machine should turn out to be of immense value to orchardists, vignerons, and farmers who wish to dress affected crops, or distribute fine manures in a very even manner, and it is fortunate that several are shortly expected in the Colony by Messrs. James Martin & Co., of York-street, Sydney.

Fruit-growers' Conference.

The Conference of fruit-growers which, at the invitation of the Minister of Mines and Agriculture (the Hon. Sydney Smith), met at the Royal Society's Rooms on the 18th, 19th, and 20th February last, was in every sense a pronounced success, both from its representative character and from the work performed. A special bulletin, containing a full report of the proceedings will be issued by the Department in due course. In the meantime it may be mentioned that a striking feature of the meeting was the excellent display of fruit, which was collected by the various delegates as representative of their districts. This disclosed the fact that some of the inland districts of the Colony are peculiarly adapted to the growth of apples. A particular sort, which is generally known in the Metropolis as one of very moderate size, grows in some districts to a perfection which was almost unheard of previous to the Conference. This remark applies also to many

Ayuntamiento de Madrid

other kinds of fruit, and formed the most conclusive evidence of the necessity for the information sought for by object No. 1. Object No. 2—to obtain the correct names of different varieties of fruit—was very considerably advanced by the appointment of a committee, which, as far as time and circumstances permitted, rendered excellent service in naming specimens which were either unnamed or to which wrong names had been given. The discussion on the different diseases of fruit (Object 3) was much enhanced in interest by the eloquent and instructive addresses delivered by Dr. Cobb and Mr. Olliff, respectively Pathologist and Entomologist to the Department, and considerable practical light was thrown on this important subject by the information given by various delegates. The general subject of manuring (Object 4) was one which was full of interest to the delegates, many of whom gave important practical information, and advantage was taken of the discussion by the Director to impress most strongly upon growers the importance of intelligent manuring as a preventive of disease, and the value of potash in particular. An interesting and spirited discussion took place on object 5—the means of utilising surplus fruits—which will doubtless impress itself permanently on the minds of delegates, and result in some energetic action to prevent the appalling waste of fruit which is taking place at the present time. The proceedings were brought to a close by a picnic given by the President (the Hon. Sydney Smith), and which was attended by all the delegates who had been able to remain. The general consensus of opinion amongst these gentlemen was that this Conference was the stepping-stone to most important reforms and to a great increase of the fruit-growing industry, and had, moreover, the effect of showing the growers of the Colony the extent of the interest taken by the Department in their welfare.

Sugar-cane.

In view of the numerous complaints of arrowing in sugar-cane it was decided by the Department that steps should be taken to obtain some entirely new specimens for experimental purposes. With this object in view, communication was opened with Mr. John Horne, the Director of the Botanic Gardens, Mauritius, who in due course despatched the following:—

No. 1. Bamboo blanc or Bourbon Rosée	24
No. 2. Bamboo rayée or Bourbon rayée	26
No. 3. Louzier	24
No. 4. Branchée blanche	15
No. 5. Blanchée rayée...	6

explaining in a letter which accompanied the consignment that Nos. 4 and 5 were few in number, as they were counted worthless in Mauritius and out of cultivation.

The Department having, after careful consideration, selected the farms where the experiment could be tried with the greatest chance of success, the shipment, as it reached Sydney, was forwarded on 30th January last to John Perry, Esq., M.P., for distribution to—

John Ball, Example Farm, Lismore.
C. V. de Malsburg, Alstonville (R.R.S. Co.)
— Wyness, Esq., Manager, C.S. and R. Co., Broadwater.
S. Wareham, Byron Bay.
J. Perry, Alstonville.
H. M. M'Caughey, Tuckerimba.

Ayuntamiento de Madrid

The growth of the canes is being carefully watched and noted, with a view to exhaustive, and it is hoped satisfactory, reports being made to the Department.

The Date Palm.

The Department has recently distributed about 9,000 seeds of the date palm in various parts of the Colony; but these will chiefly be utilised for sowing round Government tanks in the more arid districts of the Colony, and will have the effect, it is hoped, of reducing evaporation, and at the same time form pleasant and refreshing oases in the dry districts of the far west.

Presents and Distributions.

Mr. J. S. Edgar, the curator of the Botanic Gardens, Rockhampton, has kindly forwarded to the Department a number of valuable fruits and seeds, which include carob beans (*Ceratonia siliqua*), teak seed (*Tectona grandis*), fruit of the tamarind, and a large quantity of mango seeds. These have been distributed.

In pursuance of the intimations made from time to time through the Press, the Department has distributed a large quantity of rice throughout the north-eastern portion of the Colony for experimental growth, and will, in due course, receive reports of the results obtained by the recipients.

National Prize Awards—Orchards (in any part of the Colony).

Messrs. Scobie, M.L.A. Gelding, and Harold, the judges appointed to adjudicate as to the prizes to be awarded to orchardists, have sent in their recommendations, which have been duly approved by the Minister. The following is a table of the awards:—

Orchards over 10 *acres.*

Mr. Thos. Tozer, Forbes	1st Prize.
Mr. W. G. Middlemiss, Deniliquin ...	2nd Prize.
Messrs. Brown Bros., Sherwood	Highly commended.
Messrs. Jackes Bros., Armidale	,,
Mr. F. Wilson, Moonbi	,,
Mr. T. Grunsell, Goulburn...	Commended.
Mr. J. T. Ellison, Springwood	,,
Mr. A. Arnold, Crookwell	,,

Orchards up to 10 *acres.*

Mr. G. Walker, Emu Plains	1st Prize.
Mr. G. Bool, Merilla	2nd Prize to be divided
Mr. T. R. Porter, Gordon	2nd Prize to be divided
Mr. A. Manson, Goulburn...	Highly commended.
Mr. G. Lovell, Ryde	,,
Mr. Thos. Miller, Tenterfield	,,
Mr. G. Smith, Goulburn	,,
Mr. J. Bradley, junr., Armidale	Commended.
Mr. F. J. Dengate, Picton	,,
Mr. W. Gray, Keiraville, near Wollongong	,,

Ayuntamiento de Madrid

Irrigated Farms.

The entries in the "Irrigated Farms" competition were two in number—viz., Messrs. N. A. Gatenby & Co., of Jemalong, near Forbes, and Mr. W. W. Magill, near Narrabri. The prize was awarded to—

Messrs. N. A. Gatenby & Co.,

the judges—Messrs. H. G. M'Kinney, J. B. Donkin, and J. Harold—stating Mr. Magill's farm had no claim to compete owing to the irrigation works not having been utilized during the past season.

South Coast Farms.

In accordance with the report of Messrs. J. P. Dowling, Geo. S. Yeo, and G. P. Kerrison, the Minister has awarded the prizes as follows:—

Class I (*Farms up to* 100 *acres*).

Messrs. Haywood Bros., Pambula ... ... 1st Prize.

Class II (*Farms over* 100 *acres*).

The Bodalla Co., Ltd. ... ... 1st Prize.
B. Conlon, Freeman's Reach, Windsor ... 2nd Prize.

On a subsequent report by the same judges special prizes of £10 each were granted to—

Mr. Martin Thurn, of Camden, for general excellence;
Mr. G. J. Hindmarsh, of Gerringong, for dairy farm, irrespective of agriculture.

Dairying.

For best managed Dairy with regard to building, methods, and appliances.

The Bodalla Co., Ltd. ... ... 1st Prize.
John Lindsay, Unanderra ... ... 2nd Prize.

Ensilage.

For best mode of conserving Fodder for stock on a commercial basis.

The Bodalla Co., Ltd. ... ... 1st Prize.

North Coast Farms.

Acting on the advice of the judges in this section—Messrs. W. Goodger, E. Carter, and S. Sohn—the prizes have been awarded as follows:—

Class I (*Farms up to* 100 *acres*).

Mr. George Crispin, Carr's Creek, Clarence River ... ... 1st Prize.
Mr. B. Muscio, Taree ... ... 2nd Prize.

Class II (*Farms over* 100 *acres*).

Mr. E. Rossiter, Kempsey ... ... 2nd Prize.

No first prize was awarded in Class II.

Ayuntamiento de Madrid

South Tableland Farms.

In accordance with the report and recommendations of the judges, Messrs. G. T. A. Styles, Robt. Anderson, and Geo. S. Prentice, the prizes in this section have been awarded as follows:—

Class I (up to 320 acres).

Mr. George Godfrey, Gocup, Tumut... } Divided 1st and 2nd Prizes.
Mr. T. C. Warboys, Spring Hill ... }
Mr. R. Matuscha, Jindera ... ... }
Mr. C. Loiterton, Cootamundra ... } Highly commended.
Mr. S. Sheather, Cootamundra ... }

Class II (over 320 acres).

Mr. T. Coleman, Back Creek, Gundaroo 1st Prize.
Mr. W. Sykes, Spring Vale, Mount Macquarie ... ... 2nd Prize.
Mr. Ernest Bartsch, Jindera ... ... Highly commended.

Mr. F. O. Hebblewhite, of Millthorpe, Blayney, entered, in the ensilage section, a silo stacked on December 12th, 1890, and has been notified that the award will be made whenever his silo can safely be opened.

Apiculture.

For best managed Bee Farm, 100 Hives and over.

The judges in this section, the Rev. John Ayling and Messrs. Angus Mackay and T. H. Bradley, having forwarded their recommendations, the prizes have been awarded as follow:—

Mr. Geo. Green, Palmer's Channel, Clarence River ... ... 1st Prize.
Mr. Wm. Abram, Beecroft ... ... 2nd Prize.
Mr. A. J. Lurcock, Gosford ... ... Special certificates.
Mr. J. F. Munday, Woodville ... "
Mr. P. Riddel, Manager, Sydney Bee Co., Gordon ... ... "

North Tableland Farms.

Messrs. F. W. A. Downes, Geo. Crispin, and Geo. S. Prentice, the judges in this section, having submitted their recommendations, the prizes have been awarded as under:—

Class I (up to 320 acres).

Mr. H. Donnelly, Tenterfield ... ... 2nd Prize.

No 1st prize awarded.

Class II (over 320 acres).

Mr. W. Relton, Guyra, Armidale ... 2nd Prize.
Mr. H. Sommerlad, Tenterfield ... Very highly commended.

No 1st prize awarded.

Ayuntamiento de Madrid

Western Plains Farms.

In accordance with the report of Messrs. Henry Dawson, M.L.A., J. A. Badgery, and J. D. Norman, the prizes in this section have been awarded as under :—

Class I (*up to* 320 *acres*).

No prize awarded.

Class II (*over* 320 *acres*).

Mr. A. Brunskill, Bon Accord, near Sandy Creek ... ... 1st Prize.
Messrs. Bragg Bros., Narromine ... ... 2nd Prize.

Hawkesbury Agricultural College.

The temporary quarters at Richmond for the reception of students of the Hawkesbury Agricultural College were formally opened on the 16th inst. by the Minister of Mines and Agriculture (the Hon. Sydney Smith). The Minister was accompanied from town by Mr. Sydney Burdekin, M.P., and Mr. A. Bowman, M.P., and was received at the station by the Mayor and Aldermen of Richmond, and a number of gentlemen from the surrounding district. On the arrival of the ministerial party at the temporary college the students, twenty-six in number, were introduced to the Minister by Mr. Principal Thompson; after which a congratulatory address was read by student Farnell on behalf of his fellow students. The Minister, having returned thanks for the address, delivered an important speech, in the course of which he detailed the intentions of the Government in regard to agriculture, and the scope of the college curriculum. The whole party then partook of a luncheon provided by the Municipal Council; after which the Minister proceeded to the Common and fixed the site for the new college buildings, and turned the first furrow.

The prizes offered for competition by the students consist, so far, of a gold medal by the Minister for the best student in practical agriculture, a yearly prize for the best student in Chemistry by the Director, a gold medal by the Principal, a gold medal by a resident of Richmond for the best student in stock raising, and prizes by the Entomologist, the Pathologist, and the Botanist to the Department, for the best student in their respective subjects.

Sydney : George Stephen Chapman, Acting Government Printer.—1891.

Ayuntamiento de Madrid