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# Journal of the Royal New Zealand Institute of Horticulture

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No. 3.

## Phormium in Horticulture and Industry

(By A. L. Poole, B.Sc. For., Wellington.)

Around the name phormium is written a chapter in the industrial annals of the Dominion. The fibre produced by the plant was used extensively by the Maori for clothes, nets, baskets and many other purposes, and was amongst the first articles in the overseas trade of the Dominion. Until refrigeration enabled meat to be exported in quantity, it formed a considerable proportion of the value of exports. Fortunately, it was possible to extend this profitable trade by the remarkable manner in which natural areas could be increased considerably by drainage of swamps and shallow lagoons, where phormium was present near the edge. These for a time supplied the trade with green leaf, but, owing to various causes, mainly ecological in nature, were reduced considerably in size, until to-day there are barely sufficient areas left to produce fibre for the internal market. This market is capable of considerable expansion, and phormium is a plant, the innate possibilities of which, have only been exploited to a very small extent. There are many avenues for experiment in attempting a rehabilitation of the industry, and some of these avenues have assured success.

Phormium, too, has a high value in garden and landscape work, being used extensively in this country and also overseas. Possible extended use in these directions is considered.

Phormium, commonly known as "New Zealand flax," is a genus of the Agave family, and is indigenous to New Zealand and Norfolk Island. Dr. Hutchinson, of Kew, remarks: "This group may be regarded as a half-way house between the Liliaceous stock and the climax group of the Palmae. It is not clearly marked by any one character from the Liliaceae and is based mainly on habit. As such it may not appeal to some botanists, especially those of the older school. It may be regarded as a family composed of the most advanced tribes formerly included in the Liliaceae and Amaryllidaceae, the ovary being superior or inferior. The root-stock is never bulbous, the habit is usually arborescent, whilst the inflorescence is never umbelliform as in Amaryllidaceae (sensu

stricto).” Under Hutchinson’s classification, the New Zealand cabbage trees, (*Cordyline* spp.), have also been placed in the Agavaceae.

The relatives of phormium include many other fibre plants such as Bombay Aloe fibre (*Agave vivipara*); Bowstring hemp (*Sansevieria zeylanica*); Henequin, (*Agave fourcroydes*); Mexican fibre (*Agave heteracantha*); Mauritius hemp (*Fucrea gigantea*); and Sisal hemp (*Agave sisalana*.)

Two species are now maintained by botanists: the New Zealand flax or Harakeke (*P. tenax*), and the mountain flax or Wharariki (*P. colensoi*.)

*P. colensoi* differs from *P. tenax* in its smaller size, softer fibre, yellowish flowers, and long twisted capsules.

The two species can readily be separated, but both show a high degree of polymorphy and a number of varieties of each form a range of plants showing a gradual transition from one to the other. When a single character such as fibre quality, a character of importance to millers, is studied, the variation is extreme.

#### ECOLOGY.

The ecology of phormium is so vitally important in understanding the habits of the plant, and in the management of natural areas or plantations of *P. tenax* that some space will be devoted to it.

In the virgin plant covering of the Dominion, *P. tenax* grew under a wide range of conditions, from what may be termed dry-land habitats to wet-land habitats. Dry-land habitats consisted mainly of belts near the sea coast. Remnants of these belts are still to be seen in Canterbury and on the West Coast (fig. 1) where phormium appears to have been one of the dominant plants of the fore-dunes, and even to have extended right up to the high-tide mark. In the settlement of the country by white men, a number of these stands were milled, but most have now been converted to pasture as the country is easily farmed.

The wet-land habitats, by far the most common, usually consisted of a margin of *P. tenax* around the edges of swamps, shallow pools or lakes. From remnants of these areas which exist to-day, the nature of their occurrence can be reconstructed somewhat as follows: forest, frequently kahikatea (*Podocarpus dacrydioides*), grows to within a short distance of the edge of the swamp or sheet of water. Inside this is a belt of shrubs of species of *Coprosma*, *Hebe*, *Muehlenbeckia*, *Cordyline australis*, and other shrubs, depending on the situation of the area. This belt usually has some bushes of phormium in it. Inside this is the phormium belt, and as conditions become progressively wetter, raupo, and finally nigger-heads, if the water is deep enough. There may be extensive areas of swamp vegetation consisting of rushes and sedges. In this and in any raupo there will be a multitude of phormium seed-





Fig. 1. *Phormium tenax* growing naturally on consolidated fore-dune; West Coast, South Island. To the right, *Phormium* has been cleared and the dune sown to pasture.

lings which, on account of the very damp conditions, never develop beyond a small stage. From the phormium belt through to the nigger-heads, the presence (or any change of) the various communities, depends mainly upon water-table conditions. Thus the conditions for phormium are a low water-table during the growing season, a high water-table, practically at ground level during the winter, but a minimum of surface water for any length of time. In phormium stands that are being cut, the deleterious effect of this surface water is much greater than in untouched stands, for water lying on freshly cut plants is very harmful. These conditions vary somewhat depending upon soil fertility: thus a highly fertile soil will tolerate a generally higher water-table than a poor soil. An essential condition of this water-table is that it must be moving, for phormium is intolerant of stagnant conditions. The belt of nigger-heads will thrive where surface water is present nearly all the time.

Any alteration of this water-table will lead to change in the plant communities and it is in this way that extensive areas of so-called "natural phormium swamps", which supply the bulk of the green leaf for the trade, were brought into being. They were actually induced by means of drainage, thus altering the water-table to suit phormium. Upon drainage the seedlings in the raupo and other swamp vegetation shoot up very rapidly, forming ex-



Fig. 2. An induced stand of *Phormium tenax* capable of cutting 40 tons of green leaf per acre. Moutoa, Manawatu.

tremely dense stands in which little else can compete (fig. 2.) In this remarkable yet simple manner, areas were quickly brought into production; but, as can be seen in many places on the West Coast and elsewhere, can just as quickly go out of production, when, with slump conditions in the trade, drains are not attended to, and reversion to communities tolerating wetter conditions takes place.

Just as a lowering of the general water-table induced much phormium, so a further lowering led to the disappearance of many areas. They were over-drained, leading to the death of much phormium and the encroachment of weeds, in particular blackberry, which found conditions suitable. In the management of natural areas it is therefore quite essential to be able to control the water-table conditions to the particular requirements of phormium on that area.

The distinction between dry-land and wet-land types of *Phormium tenax* in its natural state is of the utmost importance commercially, for while dry-land types will grow under wet conditions and vice-versa, they are better kept to their respective habitats, if the best results are desired. Of course a range of types may be obtained to suit intermediate conditions. Judging from the small remnants of Maori plantations and preliminary experimental areas, the indications are that there are decided possibilities in the establishment of large areas of dry-land types. There are, of course, bound to be obstacles to be overcome, the most apparent of which



would appear to be trouble from insect damage under dry conditions. This has already taken place in epidemic degree in one or two plantations of the South Island.



Fig. 3. *Phormium colensoi* community on a coastal cliff.

*Phormium colensoi* grows naturally in situations ranging from coastal cliffs (fig. 3) and sand dunes to sub-alpine associations. Some coastal scrub associations have *P. colensoi* dominant, good examples of which are to be seen in the East Cape and Rushine-Cook Botanical Districts. In mountain communities it is again frequently dominant. The burning of southern beech forest or sub-alpine scrub may lead to replacement by tussock-grassland or by a colony of *P. colensoi*.

Because of the soft qualities of the fibre, *P. colensoi*, or its cross with *P. tenax*, will probably be used extensively in the future. There should be no trouble in establishing plantations of plants from this cross in dry situations.

#### STRUCTURE AND LIFE HISTORY.

The lower part of the stem of phormium is reduced to a short rhizome about as thick as the wrist. The upper part is fore-shortened and the leaves on it are packed closely together in ensiform arrangement, the whole giving the appearance of a fan. The number of leaves per fan is usually 8 to 10, but may be much greater. Between the ad-axial base of each leaf and the stem, buds are developed. These may remain dormant or develop into new fans depending upon the age of the plant, variety, season and growing

conditions. In seedling plants, a number of these develop fans, so that a year old plant may have up to eight. These, of course, are very small, as the total height of the plant at this stage is only about 12in. to 15in. Plants three years old may have up to 15 fans: these are still small, but from then on large fans are produced. The ultimate number of fans a plant may have depends upon a great many circumstances, and will be discussed more fully in the following paragraph. The fans are aggregated together to form a bush (fig. 4.)



Fig. 4. A well grown bush of Ngaro, a widely distributed Maori variety of *Phormium tenax*.

When a fan is mature (in from 3 to 6 years) the stem produces no more leaves and the topmost bud is produced into an inflorescence. Since the production of new leaves ceases and the life of the leaf is only 3 to 4 years, the fan commences to die after flowering, taking up to 2 to 3 years. The place of the dying fan is taken by one or more young fans developed some time previously near the base of the parent. The new fans are generally produced to the outside of the parent, so that when a bush has ample growing space a ring of fans is built up. The centre of the bush is occupied by old rhizomes from which fans have been borne, flowered and died, while the outside is made up of mature to young fans on the ends of rhizomes. In this way, under ideal growing conditions, the number of fans on a bush increases slowly and could theoretically go on indefinitely. Actually bushes with 200—300 fans have been seen. In a dense natural stand of plants on the other hand, the number of fans per plant remains static, as competition for air space,



root space and light is so great that there is only room for a single fan to take the place of one that dies out.

There is a tendency for plants to grow upwards all the time, as new fans are theoretically, and frequently in nature, produced a little higher each time. Plants may actually be trained so that leaves are some feet from the ground. This characteristic has a serious effect in commercial areas where the habitat conditions are not quite right for phormium, and the stands are prone to invasion by weed species. For example, tall fescue is a serious weed in the Manawatu flax areas where conditions are too dry for phormium. This plant grows close to the phormium bushes, and as new fans are formed, they rest on the top of the fescue clumps. In this way they are raised in the air, and are easily broken off by cutters or die out because of poor connections through the old rhizomes with the root system.

The root system is adventitious, a number of stout, fleshy roots extending to distances up to 8 feet, or even more, from the plant in lateral or downward directions. There is an extensive surface root system with rootlets coming right to the surface. Where the soil permits, there are also roots penetrating to depths of 6 feet to 8 feet. As each new fan is formed, roots are given off near its base and these go to form the bulk of the system. Some roots still remain alive on the old part of the rhizome, so that the nourishment of a new fan is drawn partly through these and partly through roots from its own base.

Inflorescences are produced by a few fans when a bush is 5-6 years old. In the majority of varieties, this flowering takes place in very marked seasons three to four years apart, with only a few inflorescences produced in between these seasons. Each scape or inflorescence produces a large number of flowers, the opening of which commences at the bottom of the scape and at the proximal end of each branch of the scape, and proceeds upwards. Not all the flowers form pods; many fall owing to insect damage before they are even fertilized. During the wet weather, insect visitors are scarce, and much pollen spoiled, so that many flowers wither without being fertilized. The flowers are protandrous and not self-fertile. Even flowers from the same inflorescence do not readily cross-pollinate. Cross pollination between flowers from different bushes or inflorescences is performed by insect visitors, and by birds. It is doubtful if wind plays much part in the carriage of pollen.

#### COMMERCIAL STATUS OF PHORMIUM.

The commercial value of phormium lies in the use of the leaf fibres. These are conducting strands and their supporting tissue, and run parallel from the proximal to the distal ends of the leaf, and extend from the upper to the lower surface. The fibre is termed a hard fibre, and hitherto, beside supplying an internal market, has entered the export market in competition with other

hard fibres, chief among which are manilla hemp, sisal hemp, and henequin. All these fibres are replacable so that their entry into the market depends upon availability and constancy of supplies, grading and marketing of that supply, and cost of production. New Zealand has never supplied a very large proportion of the export market, and the export quantities have, therefore, been ruled by the production of rival hard fibres. Just before the war it had been driven completely from the export market.

Using Maori stripped fibre, the first traders to visit the Dominion soon commenced a profitable business with Australia and England. There followed the establishment of the first stripping mills at the beginning of the nineteenth century. From that time, the trade, with fluctuations, increased to a peak in 1907.

With the period of increasing trade, people interested in phormium found that many natural swamps could be drained in such a manner that phormium was induced and practically took charge of them. This did not happen for some time, for Hector, writing in 1870, says: "What are frequently termed flax swamps have often merely a margin of phormium around the edge, the greater part of the extent being covered by raupo. It is true that in the swamps, when drained, a luxuriant growth of phormium usually springs up, but this required considerable time and large expenditure, so that such swamps cannot be considered as immediately available for affording natural supply." Later, however, extensive areas, particularly in the Manawatu, were induced, a number of them inadvertently, for the drainage was intended to convert them to farm lands.

Early in the twentieth century, phormium became a valuable crop and large profits were made from natural areas. Attempts were made to improve these areas by further drainage and stop-banking the rivers along which these areas lay. The induced phormium, essentially a swamp community, found itself with drier conditions than suited it. Moreover, many of the soils of these areas were in part peaty. This fact aggravated conditions as they sank with excessive drainage, leaving some of the plants well out of the soil. Many phormium areas commenced to die out and the disease called "yellow-leaf" commenced its ravages about this time. It is certain that the main factors in starting it were the altered edaphic conditions. It reached epidemic proportions and wiped out extensive areas, so that owners of the land had no option but to resort to complete conversion to farming land. Thus, there occurred, for some years, the paradox of high prices, and consequently a keen demand for the fibre, accompanied by a gradual diminution in supply, due to the ecology of the plant not being fully understood. In this way it is estimated that some 15,000 acres in the Manawatu alone disappeared from about the year 1912 to the present day. One frequently hears the statement that phormium areas were converted to dairy farms because the land consisted of good silt, and it was more profitable to farm. This might be so to-day, but in the years when most of the conversion



took place this statement is not borne out by statistics on the phormium trade, nor will it bear the light of historical enquiry. The conversion was at least commenced by other circumstances, and finally much of it continued on in the depression years of the industry which followed some time after the war. To-day, the export market has gone; but there is a firmly entrenched internal market for rope, twine and wool packs, and this is capable of great expansion. The depleted areas do not allow of this expansion so that attention is being turned to the feasibility of more intensive utilization of present areas and the possible creation of new ones. This work must rest upon accurate ecological information and study of growth of selected types under various conditions.

Phormium has been introduced commercially to a number of other countries. In the island of St. Helena, for example, it yields the main export commodity. At the delta of the mouth of the River Plate in South America are extensive plantations, while in Japan it is reported that there are 100,000 acres in phormium.

#### HORTICULTURAL USE.

Phormium is used largely as an ornamental plant, growing either singly or grouped in small gardens, or to produce a broad effect in landscape gardening. Its unusual shape and grace, particularly when in flower, offers welcome variation to trees and shrubs. (Fig. 5.) To bird lovers, it is a very desirable species as its honey bearing flowers attract many birds in particular the bell-bird and tui.

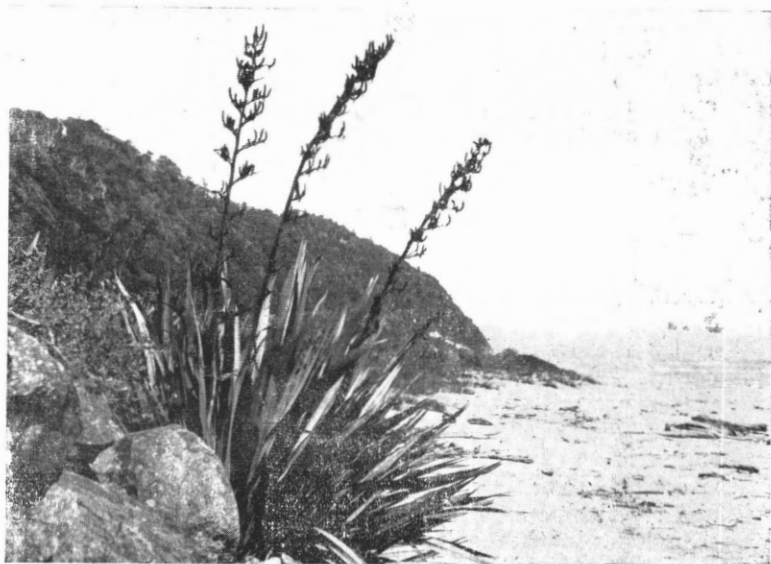


Fig. 5. An ideal landscape use of *Phormium tenax*,

The great variation of phormium in size, variety, and demands upon habitat, makes it possible to use plants under many different conditions. Dry land varieties can be grown in quite dry places, while swamp varieties can be used for damp places, bog gardens or the edges of natural pools. Several varieties, very ornamental in nature, have been picked out and propagated by nurserymen. These include reddish green or bronze varieties, and variegated forms of both species.

*P. tenax* is sometimes used as a low shelter belt. These belts require double fencing, otherwise stock will damage the plants.

A brief consideration of the ecology of naturally growing plants shows that a greatly extended use could be made of the plants in landscape gardening. Difficult hillside situations offer scope for the varieties of *P. colensoi*. In roadside planting, a subject coming more and more to the fore, many situations presenting difficulties in the use of the usual shrubs and trees, would lend themselves to the planting of phormium. Steep faces and wet areas are examples of these.

Overseas, this plant is held in high esteem as a garden subject, the following statement by L. H. Bailey being typical: "These plants are popular outdoor subjects in California and climates of like mildness making very bold lawn clumps. In regions of cold winters, they are known as greenhouse tub-plants or as subjects for pricking out in summer in subtropical bedding."

### PROPAGATION.

Propagations from seed can be carried out in the usual nursery bed or by drilling into prepared ground by a Planet Jr. A pound of seed contains about 40,000 seeds, and if sown fresh, has a germination of 50 to 70 per cent. The first germination takes place in about a month and the rest follow quickly. Seeds can be sown in the autumn or the spring, but where frosts are mild and not likely to damage the seedlings by frost lift, autumn sowing is the best. Where frosts are heavy, autumn sowing involves covering the beds with scrim, so that spring sowing is preferable. If sowing is done in beds, the seedlings should not be left longer than twelve months before lining out. If drilled in rows, they may be thinned out, and those left can remain in position until such time as they are required.

The raising of a succession of seedlings year after year is hindered by the loss in viability of seed after twelve months, combined with the fact that seed is produced in seasons three to four years apart with little or no production for at least one, or possibly two, seasons in between. Preliminary experiments have been conducted to try to extend the period of viability. The first of these consisted in storing seed, which in the open had lost its viability after twelve months, but still had a germination of 10 per cent. when kept in the cool store. Another promising line is the use of varieties which do not have a marked seeding season, but produce a certain quantity of seed each year.



Seedlings do not come true to type even when the parents are both of the same clone. As growing from seed is a much quicker method of propagation than vegetative propagation, experiments have been carried out to determine the degree of variation, and if it can be reduced. It has been found that some varieties throw seedlings varying through a large range of vigour, growth-form and strength of fibre. Thus the variety S.S. shows extreme variation and even at times throws plants showing a lethal combination of the genes. Other varieties throw fairly constant seedlings, and by culling 50 per cent. to 70 per cent., plants varying but little from the plants are left.

The variation of plants from seed mentioned above, makes it necessary to resort to vegetative propagation if the production of pure clones is desired. Fortunately, phormium lends itself very readily to this method. A bush is split into single fans or several fans joined together by a common rhizome. Fans that have had flowering stalks, or on which flowering stalks are developing must be discarded as these will die. No particular care need be taken to retain any roots that might be attached to the fan, for once planted out, the old roots die and an entirely new system is formed. The fans may, therefore, be planted out permanently without preliminary treatment in nursery rows. This is of great significance in the establishment of plantations, as it saves much expense.

#### BREEDING NEW VARIETIES.

The aim of the breeder is to produce new strains or clones of the plant, which possess approximately the characteristics he is aiming at. The foundation of his work is the variation within the species. In phormium, he has the ideal plant with which to work. He does not have to "break" the type as in the case of constant species, for he has on hand a wealth of pliable material.

The main Maori varieties were selected for fibre qualities and included such well-known plants as Ngaro, Paretaniwha, Ngutunui, Korako, Oue, and Tihore.

The following classes of variation are marked, and of importance commercially:—

- (1) Variation in vigour of growth.
- (2) Variation in growth form; drooping, upright, etc.
- (3) Variation in fanning ability.
- (4) Variation in growth in relation to the water-table; i.e. the distinction between dry-land and wet-land types.
- (5) Variation in fibre strength and fibre quality.

The possibility of producing pure breeding elementary species or strains has to be ruled out. The parent to start with is a hybrid evidently possessing a large number of factors capable of combining in many ways to produce variation. It is also necessary to wait five to six years to pick out the bushes resembling the parent and another five to six years between each succeeding generation. The length of time involved and the amount of ground required would render the work of doubtful value,

It has been found that phormium is not self-fertile, but crossing is successful among bushes of the same clone, between varieties of *P. tenax*, and between forms of *P. tenax* and *P. colensoi*.

The inflorescence of phormium is carried high and the individual flowers on it are usually out of reach. Therefore, when the inflorescence of the selected female plant is fairly young, it is bent outwards and tied so that it is only a few feet from the ground. New growth of the inflorescence still continues upwards, but it is now well within reach of the operator. When crossing operations commence, the whole inflorescence should be covered with scrim to prevent unwanted cross pollination by insects or other agencies.

Thrip damage is likely to cause the dropping of many flowers before they have opened. In order to avoid this, it is advisable to treat the inflorescence with Black Leaf 40 every few days during the infection.

Immediately the flower opens the stems are removed. This is really a precautionary measure as self-fertilization is most unlikely. If the plant chosen as the male parent flowers at the same time as the female, it is usually picked and placed in a can of water in a shed. Theoretically this practice is perhaps not a good one, but is carried out as a matter of expediency: for plants being crossed may grow at some distance from one another, and as the crossing work is performed every day as the individual flowers open the carrying of pollen from one plant to another would involve an excessive amount of time. If the male parent flower before the female, the pollen has to be collected and kept until required.

Pollination of the female is done when a small globule of fluid collects on the end of the stigma, about three days after the flower opens. Flowers continue to open on the one inflorescence for a period of four to six weeks, and if as much seed as possible is required, fertilizing work may go on all this time.

Pods may be collected when they turn almost black, and can be left inside some time before opening, or be placed in the sun to open immediately. The seed from the pollinated plants is sown and the seedlings finally lined out. About two years from lining out, it will be possible to go through them and select plants with the desired qualities. These selected plants can then be set out with ample growing space until they are four years old, when they can be further examined and types for particular purposes, horticultural or industrial, can be selected and propagated.

## A NOTE ON LAVENDER

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(By Dr. H. H. Allan, Honorary Botanist.)

The response to the circular letter, published in our last issue, has been most generous. It is evident that considerable interest has been aroused, and that lavender growing could be undertaken in New Zealand, if it were decided that circumstances justified such a course. At the moment, however, it is clear that only very limited supplies would be available. The correspondence indicates that there is a good deal of uncertainty among growers as to the kinds of lavender and the names that should be applied to them. This note is intended to make these points clear.

It would be a long story fully to explain the history of the names used. For our purposes, the following account should be sufficient. Linnaeus, when he published the name *Lavandula spica*, included two varieties now considered distinct enough for specific names. When these two sorts were separated later, various botanists gave different names to them. The "true" lavender has been called *Lavandula officinalis*, *L. spica*, *L. angustifolia* and *vera*. "Spike" has been called *L. latifolia* and *L. spica*. The use of *spica* for both species has resulted in much confusion, so that most botanists to-day abandon that name altogether, as being ambiguous. The correct names are, therefore, *L. officinalis* and *L. latifolia*, as being the first applied when the separation was made.

From the information to hand it is clear that several species of *Lavandula* are to be found in New Zealand gardens. The following notes should enable anyone to differentiate the species, and apply the correct names. When the flowering spike is examined, it will be seen that each flower is seated just above a small leaf or bract. In using the following key, it is important to distinguish this bract from the flower proper.

- |   |                       |
|---|-----------------------|
| (1) The leaves have bluntly toothed margins .. ..   | <i>L. dentata</i>     |
| The leaves have no teeth on the margins .. ..   | 2                     |
| (2) The bract is longer than the flower, brightly coloured and conspicuous .. ..                              | <i>L. stoechas</i>    |
| The bract is shorter than the flower, less brightly coloured, and inconspicuous .. ..                         | 3                     |
| (3) The leaves are narrow, 8 times as long as broad, the upper ones greyish-green; the bracts are ovate .. .. | <i>L. officinalis</i> |
| The leaves are rather broader, 4-6 times as long as broad, all silver-grey; the bracts are narrow .. ..       | <i>L. latifolia</i>   |

Lavender is used for the preparation of oil of lavender, for bunched lavender and for dried lavender or "lavender flowers." By far the best oil comes from *L. officinalis*, though of late years "spike" has been much used. Having decided that your plant is the true lavender, you still must find out if it is a good oil strain, as some of the garden forms are inferior in this respect.

Some of the better known of the garden *Lavandulas* are the Dutch dwarfs, *Munstead*—a free-flowerer with long spikes, *L. nana compacta*, with numerous very dark blue flowers, while forms with white flowers are also met with. Lavender-cotton, *santolina incana*, is somewhat lavender-like, but has small yellow-flowered heads and is of the daisy family.

## REVIEW.

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### THE R.H.S. DAFFODIL YEAR BOOK, 1940.

The 1940 Royal Horticultural Society's Daffodil Year Book, produced and published under the trying war-time conditions of England, reflects great credit on the sub-committee responsible for its preparation.

The contents include a comprehensive list of topics of interest to daffodil growers, as well as a number of interesting reports of Daffodil Shows at Home and in Australasia. A number of excellent illustrations lend additional interest, but one cannot agree that these pictures always do entire justice to the varieties depicted. *Jean Hood*, *Elgin* and *Dervish* are typical examples of this point.

Growers will find particular interest in those chapters on diseases and their problems, contributed by scientific writers, who record the result of much patient research directed towards overcoming those difficulties, which sometimes lead to discouragement.

Reports on Daffodil Shows in Australia and New Zealand are given generous prominence, a complete chapter being devoted to the Rhodes Cup varieties of 1939, exhibited by Mr. Geo. Lewis, Christchurch.

The annual publication of the Year Books collates a wonderful fund of information concerning Daffodils and provides a valuable reference which will be of use to growers for many years. Let us hope that its publication may long continue, as, without a "Year Book", many contacts will be lost to those who have worked so hard to keep the "Daffodil Flag" flying.

—Herbert J. Poole,



## CHEESEMAN MEMORIAL NATIVE-FLOWER SHOW.

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The ninth annual show of native flowers at the Auckland Museum, in memory of the late T. F. Cheeseman, maintained the prestige gained by its predecessors. Included in the total of 7,834 visitors were over 1,800 children, whose visits were organized by Mr. R. A. Scobie, Education Officer at the Museum. The ever-increasing interest in the show has been in very large measure due to the enthusiasm and energy of the Museum Botanist, Miss L. M. Cranwell. This year that very active body, the Auckland Botanical Society, undertook the arrangement of the exhibits.

The following is taken from the annual report of the Society: "Congestion was relieved from the outset through having the opening downstairs. The first hall entered by the public could then be devoted to artistic arrangements, taken in hand by Mrs. Basil Buddle, and the high note of colour struck here was repeated in the succeeding rooms; the use of brilliant tawapou, puriri and titoki berries, together with golden kowhai and kumarahou roused enthusiasm and surprise in our visitors. Beyond the Children's section lay the City Council exhibit like a lacy screen of green shrubs, while in a third hall children's paintings were exhibited. We are proud to report that almost all the flowers exhibited were grown in gardens in Auckland or its nearest suburbs, and under the circumstances we felt no hesitation in displaying masses of colourful flowers and berries or of showy clematis. Colour and artistic arrangement draw the public and change the old view that our flora is drab." Mention should also be made of the remarkably fine display of manukas of varied hue. A pleasing memento is a booklet listing 266 of the more common species exhibited. This list gives the Maori or common name, the scientific name and the family name.

## LODER CUP COMPETITION, 1940.

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The Loder Cup award for 1940 has been made to Major P. H. Johnson, of Raincliff, South Canterbury, who was nominated by the South Canterbury branch of the Institute.

The cup was presented by the late Gerald W. Loder, afterwards Lord Wakehurst of Sussex, England, to be competed for annually in accordance with such conditions as might be approved by the Minister of Agriculture, in whose custody the cup was placed. The cup was formerly awarded annually to the winner of an open competition for New Zealand plants staged at specified national flower shows in the various centres.

A new Loder Cup committee, set up by the Minister of Agriculture, then decided that the intention of the donor of the cup "to encourage the protection and cultivation of the incomparable flora of the Dominion" could be better met by an alteration in the conditions, and the cup is awarded annually to the person or body of persons who has performed the most meritorious act during the year or whose work has culminated in that year in furthering the sentiments of the donor. In arriving at its award, the committee works along the lines of the Nobel Peace Prize.

Major P. H. Johnson's generous gift of approximately 240 acres of land, containing magnificent natural forest, will ensure conservation of native bush in at least one part of the Dominion where it is fast disappearing. Very little of the original rain forest is now to be found in Canterbury and the gift is enhanced by its accessibility to population centres.

Mr. L. W. McCaskill, of Christchurch, writes as follows in the August Bulletin of the Forest and Native Bird Protection Society of New Zealand:—"The dominant tree is white pine or kahikatea, several hundreds of them, tall, straight and clean. A recent estimate showed that there are 2,000,000 feet of timber in these white pines alone. Other big trees are totara, matai and pokaka, some of them truly noble specimens. In addition, there are over 40 species of broad-leaved trees and shrubs of typically mixed Canterbury rain forest."

The gift now forms part of a domain which is known as Raincliff Pioneer Park. Its suitability for this purpose is assured. The bush, the winding stream and the steep gullies provide a picturesque setting for a domain which should become a scenic reserve of note,

## REPORT OF THE EXECUTIVE COUNCIL FOR THE YEAR ENDED 30th SEPTEMBER, 1940.

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**PERSONAL:**—Best wishes for continued good health and happiness in his well-earned retirement have been conveyed to Mr. D. Tannock, Superintendent of Parks and Reserves, Dunedin.

The following Executive Council members from other districts have, when visiting Wellington, attended meetings during the year:—Messrs. B. P. Mansfield (Hon. Secretary, Southland District Council), J. C. McDowall (President, Taranaki District Council) and N. R. W. Thomas (Hon. Treasurer, Auckland District Council.)

Leave of absence for the duration of the war has been granted to Messrs. B. P. Mansfield and J. W. Kealy, Chairman, Auckland District Council.

**EDUCATION:**—This phase of the Institute's activities is fully dealt with in the report of the Examining Board. The thanks of the Executive Council are again conveyed to the Board's members, examiners—in respect of the written examinations and of the separate oral tests and practical tests, conveners, etc., for their valuable assistance and the excellent manner in which their work has been carried out in an honorary capacity.

**HISTORIC TREES:**—Arising from a remit from the Canterbury District Council: "That the Government be approached with a view to preserving the trees planted by our pioneers or other historic trees," Dr. H. H. Allan, Honorary Botanist, issued a circular asking for details of historic trees and interesting lists have been published in the June and September, 1940, issues of the Journal.

**VEGETABLE AND FLOWER SEED PRODUCTION IN NEW ZEALAND:**—The following remit, from the Canterbury District Council, was passed at the 1939 Conference:—"That the time has arrived for the establishment in New Zealand of the commercial production of vegetable and flower seeds."

Owing to the prolonged illness of Mr. W. K. Dallas, Director of the Horticulture Division of the Department of Agriculture and Convener of the Special Committee appointed at the 1939 Conference, the Committee's report had to be held over until the 1940 Conference. The report has since been published in the September, 1940, Journal, and has evoked much interest.

**CONGRATULATIONS** have been extended to Mr. Thomas Horton on the recent grant of his long overdue and richly deserved title of Superintendent of Parks and Reserves, New Plymouth.

**LODER CUP COMPETITION, 1939:**—The Loder Cup Competition for the year ended 30th November, 1939, was won by Mr. William Alexander Thomson, Halfway Bush, Dunedin, who is widely known throughout New Zealand, and especially in Otago, as an energetic field botanist and a keen horticulturist with a special devotion to native plants.

**NATIONAL HORTICULTURAL WEEK, 1940:**—The Tenth National Horticultural Week was held at Wellington from the 30th January to the 2nd February, 1940, when the Annual Meetings of the following bodies were held:—The Institute, the New Zealand Horticultural Trades' Association, the Horticultural Seedsmen's Association of New Zealand, the Association of Directors of Parks and Reserves and the New Zealand Florists' Telegraphic Exchange. The delegates were given a civic welcome, combined with the official opening, by Sir Harry Batterbee, High Commissioner for the United Kingdom, of the National Conferences and the National Centennial Flower Show. The Show was held at the Centennial Exhibition Buildings, Wellington, during the currency of the Exhibition and, although somewhat restricted for space, it undoubtedly set a standard of uniformly high quality. The next profit of well over £400, although assisted by the grant of £100 by the Hon. Minister of Internal Affairs, nevertheless shows capable management by the President, Mrs. Knox Gilmer, and her executive officers.

**BANKS LECTURE:**—Professor H. B. Kirk, of Victoria University College, and Chairman of the Institute's Examining Board, delivered the Banks Lecture for 1940, his subject being: "Tree Ferns and other Ferns." The lecture was given in the excellent Lecture Hall of the Dominion Museum and illustrated with appropriate lantern slides, and the subject was interestingly dealt with by an outstanding botanical authority.

**DISTRICT COUNCILS:**—Auckland has again given valued assistance with the collection of subscriptions and has been active in forest preservation and tree planting schemes, especially at Government Aerodromes.

Taranaki has continued its successful monthly meetings with addresses and has assisted with membership and subscriptions.

Canterbury continues to be active in its educational activities.

South Canterbury has enrolled several new members and is in active touch with horticultural activities in its district.

Otago has been revived under the Secretaryship of Mr. D. Tannock, with Dr. J. E. Holloway, as President,



Southland has temporarily lost the services of Mr. B. P. Mansfield, who is on active service and Mr. K. I. Robertson is acting in his absence.

NATIONAL HORTICULTURAL WEEK CONDITIONS were revised early in the year by the Joint Permanent Committee and were published in the April Journal so that the procedure for every activity of the Week is now clear.

FINANCE:—Although subscriptions only show a slight decrease, examinations fees show a substantial drop due partly to war conditions, but mainly to the re-opening last year of Group B. The half-share, already paid, of the profit from the National Flower Show, 1939, viz. £200, has been of great assistance. Had it not been for this, the period under review would have ended with a less favourable balance than the previous year. It is hardly likely that circumstances which produced such a satisfactory profit will recur for a long period so that the renewal of the Government grant under existing circumstances is much appreciated.

## REPORT OF THE EXAMINING BOARD FOR THE YEAR ENDED 30th SEPTEMBER, 1940.

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**PERSONAL:**—Congratulations have been extended to Mr. T. Horton, New Plymouth, a valued examiner, on his well-merited appointment as Superintendent of Parks and Reserves.

It is pleasing to record that Mr. C. W. Corner, an examiner at Hawkes Bay, has recovered from his illness and acted at the recent oral and practical portion of the examination.

Canterbury has suffered a severe loss in the resignation of Mr. T. D. Lennie, Examination Convener for over twelve years, who has been succeeded by Mr. C. E. Foweraker.

Otago is fortunate in retaining the services as Examination Convener of Mr. D. Tannock, but Southland will greatly miss Mr. B. P. Mansfield while he remains on active war service.

**EXAMINATION CENTRES:**—In addition to the four main centres and Invercargill, the following are now recognized as examination centres—Hastings, New Plymouth and Palmerston North. As in other centres, each of these has an approved panel of examiners for the oral test and the practical test.

**SYLLABUS:**—Following on a remit from the Canterbury District Council and after consultation with the Education Department, the Syllabus has been amended, in respect of the Junior Examination, by the omission of Agriculture from the Science subjects, retaining Chemistry and General Experimental Science, as prescribed for the Public Service Entrance Examination conducted by the Education Department.

**ORAL TEST AND PRACTICAL TEST:**—Commencing with the Annual Examination, 1940, the Board decided that separate marks should be awarded, at all centres, for the Oral Test and for the Practical Test. This procedure has been carried out by the Canterbury District Council practically from the initiation of the Scheme of Training and Examination.

**J. A. CAMPBELL MEMORIAL AWARD:**—The first J. A. Campbell Memorial Award of approved books, to the most successful Intermediate student in the 1939 Examination, has been made to Mr. J. W. Goodwin, of the Christchurch City Reserves, who chose a set of Bean's "Trees and Shrubs hardy in the British Isles" as a welcome addition to his horticultural library.

**HORTICULTURAL TRAINING AND EXAMINATIONS:**—The second annual article on this subject appeared in the previous issue of the Institute's Journal. As the Journal is issued free to all registered students, the article has been found useful in keeping them in touch

with amendments to the Syllabus and Circulars, alterations in training and examination procedure and advice on matters of interest.

**LECTURES:**—Congratulations have again been extended to the Canterbury District Council on its excellent Syllabus of Lectures in Horticulture, for trainees and others, at the Christchurch Technical College, and similar procedure has been suggested to other District Councils. Mr. C. E. Foweraker, Canterbury University College, delivered to Christchurch Botanic Gardens trainees a series of lectures, during working hours, on "Plant Physiology" and "New Zealand Native Timber Trees." The latter series was attended by other than trainees. Mr. L. W. McCaskill, Christchurch Training College, offered to coach these trainees for one hour per week during the day time and Mr. F. J. E. Jollie, Propagator, is setting a series of papers for practical work. The formation of a Mutual Improvement Club for Christchurch Botanic Gardens trainees and City Reserves apprentices, is dealt with on page 40 of the September Journal.

Mr. L. W. Delph, Hon. Secretary of the Taranaki District Council, who is now engaged practically full time on national service, has been running a class in plant protection, general botany, classification and ecology, mainly for the Institute's examinations.

The Otago District Council has reported that suitable classes for students are being conducted at King Edward Technical College, Dunedin.

**THANKS:**—The Board has again to record its thanks to District Councils; to local conveners and examiners who conducted the oral and practical tests, examiners, who set and marked the written papers; to coaches and lecturers who gave voluntary instruction to trainees; to those who acted as supervisors and to all others who assisted, in any way, with the examinations.

**EXAMINATIONS:**—The number of candidates for the November, 1939, Examination, was 36, but this included six Group B candidates and one Group C for the Diploma Examination and several with previous partial passes. The following is a summary of the results:—

Examination.	Complete Pass	Partial Pass.	Failure.
Junior	2	8	2
Intermediate	5	1	
Diploma	8	10	

**DIPLOMAS AND CERTIFICATES:**—List of Diplomas and Certificates granted under Section 4 of the New Zealand Institute of Horticulture Act, 1927, since the issue of the 1938-39 Annual Report.

#### DIPLOMA IN HORTICULTURE.

Baillie, Miss Erica; Wellington.

Cooper, Reuben Gilbert; Greymouth.

Everett, Percy; Keri Keri, North Auckland.  
 Gilpin, Huia Gray; Christchurch.  
 MacKenzie, Dugald Carr; Wellington.  
 Malcolm, Norman Alexander; Feilding.  
 Thomas, Hector Percival; Invercargill.  
 Watters, William Smith; Auckland.

#### INTERMEDIATE CERTIFICATE IN HORTICULTURE.

Goodwin, John William; Christchurch.  
 Hancock, Derrick Corbett; Dunedin.  
 Long, Miss Pamela Roylance; Dunedin.  
 Reston, David Pridham; New Plymouth.  
 Tannock, James Lindsay McColl; Dunedin.

#### JUNIOR CERTIFICATE IN HORTICULTURE.

Bent, Ernest Leslie; New Plymouth.  
 Hancock, Derrick Corbett; Dunedin.

#### TOTALS ISSUED TO DATE.

Owing to a printer's error in the final print of the last annual report, the totals for Junior and Fruit Culture Certificates were shown as 1 and 54 instead of 45 and 1 respectively. The correct totals to 30th September, 1940, are:—

Diploma:	Without Examination	..	..	..	..	..	..	170
	By Examination (All Groups)	..	..	..	..	..	..	65
Certificates:	Intermediate	..	..	..	..	..	..	38
	Junior	..	..	..	..	..	..	47
	Fruit Culture	..	..	..	..	..	..	1
	Florists	..	..	..	..	..	..	54
	Seedsmen	..	..	..	..	..	..	18

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## INSTITUTE NOTES.

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**PERSONAL:**—At the October Executive Meeting, a welcome was extended to Mr. M. J. Barnett, Superintendent of Parks, Reserves and Plantations, Christchurch, and President of the Canterbury District Council and also to Mr. H. L. Cummings, who will act as representative of the Wellington Beautifying Society vice Captain S. Holm. It was mentioned that Mr. A. W. Nisbet would again act as representative of the Dahlia Society of New Zealand.

We were also pleased to welcome, at the November meeting, Mr. J. A. McPherson, Director of the Botanic Gardens, Christchurch, and Past President of the Canterbury District Council.

Seasonal greetings from Mr. B. P. Mansfield, on active service, were heartily reciprocated at the above meeting.

**EDUCATIONAL:**—The Dominion Secretary reports that, on his recent trip to Oamaru, he was the guest at Christchurch of Mr. M. J. Barnett, when certain City Reserves were viewed and calls, on the outward journey, were made at the Timaru and Oamaru Botanic Gardens. On return, a day was spent with Mr. J. A. McPherson, at the Christchurch Botanic Gardens, meeting Institute's students and seeing their training facilities. Not the least interesting was a visit to the Christchurch Training College to meet Mr. L. W. McCaskill and to view the unique garden plots, designed and planted by himself as a labour of love, mainly for the instruction of students.

**TARANAKI DISTRICT SECRETARY:**—Mr. L. W. Delph, M.A., Hon. Secretary of the Taranaki District Council, recently tendered his resignation locally on account of his appointment as Area Commander, for North Taranaki, of the Home Guard.

The following was included in the Dominion Secretary's acknowledgment on behalf of the Executive Council:—

“Whilst realizing that the undertaking of national service, for which you are eminently adapted, has necessitated this step, I can only voice the Executive Council's regret at losing the services of one who has done so much to make the Taranaki District Council and its activities and enthusiasm, an outstanding example. We all hope, however, that you will soon be back in your old position.

It has always been a pleasure to help a District Council of which we have all been proud and a Secretary who has always made the pathway smooth.”

**BANKS LECTURE, 1941:**—At the December, 1940, meeting, it was noted with pleasure that Mr. D. Tannock, of Dunedin, had agreed to deliver the Banks Lecture at Oamaru, on Thursday evening, 6th February, 1941. The title chosen is “The History, Development and Activities of Reserves Departments in New Zealand.”

From the doyen of Parks Superintendents in New Zealand, no subject could be more appropriate or more interesting to horticulturists of all grades.

NATIONAL HORTICULTURAL WEEK, 1941:—At the November monthly meeting of the Executive Council, the Dominion Secretary reported a visit to Oamaru, on the 13th November, by a deputation consisting of Messrs. M. J. Barnett and J. A. McPherson (Christchurch), A. W. Anderson (Timaru), and himself, who attended a meeting that evening in the Borough Council Chambers, which was presided over by the Deputy Mayor and convened by Mr. Hargreaves, President of the North Otago Horticultural Society.

The meeting included representatives of governmental, civic, local, educational and other authorities and bodies, North Otago Horticultural Society's committee, and a fine representation of ladies from the Society and from Women's Clubs and Institutes, etc., who offered hospitality and entertainment to visitors and every assistance to National Horticultural Week, 1941, including the National Flower Show.

It was reported that the show would be held in an up-to-date hall with good lighting, 13,000 sq. ft. of unbroken floor space, and facilities for staging.

The visitors were entertained at supper by the President and Mrs. Hargreaves and conferred with National Horticultural Week Executive members on points affecting the Week and the Show. The Secretary's report was adopted, and members of the deputation were thanked for their assistance.

It is further reported that entries for Comprehensive Horticultural Displays have been received from Canterbury, Otago, South Canterbury, Waimate and North Otago. (In this connection it should be mentioned that a donation up to five pounds is being made by our Otago District Council towards the setting up of the Otago exhibit.) Active support is being given by the Mayor and City Council, Oamaru Harbour Board, supplemented by a donation of ten guineas, and the Oamaru Retailers' Association. Altogether, the prospects for the Week and the Show are excellent.

the year ended 30th September, 1940.

£1008 14 7

£1008 14 7

# Income and Expenditure Account for the year ended 30th September, 1940.

	£	s.	d.	£	s.	d.		£	s.	d.	£	s.	d.
To Conference Expenses—							By Subscriptions—						
Rent .....	5	15	6				Indv. Current 103 1 3						
Entertainment .....	12	9	6				„ Arrears 24 7 0						
Advertising .....	18	0									127	8	3
				19	3	0	Aff. Societies current .....				51	19	6
„ Capitation Fees—													
Auckland .....	9	6	0				Examination Fees .....				179	7	9
Taranaki .....	9	1	3				State Subsidy .....				31	10	0
Canterbury .....	4	8	0				National Centennial Flower				100	0	0
South Canterbury .....	3	3	9				Show .....				200	0	0
Otago .....	3	15	0				Interest P.O.S.B. ....				13	18	10
Southland .....	5	4	4										
				34	18	4							
„ Salaries .....				150	11	8							
„ Publications .....				62	6	10							
„ Depreciation .....				3	0	0							
„ Office Expenses—													
Rent, Light and Cleaning	40	0	0										
Printing & Stationery .....	16	10	2										
Postage and Telegrams ...	27	12	10										
Exchange .....		14	0										
Sundries .....	10	13	11										
				95	10	11							
Excess of Income over Expen- diture .....				159	5	10							
				£524	16	7					£524	16	7



**Balance Sheet as at 30th September, 1940.**

LIABILITIES.						ASSETS.							
	£	s.	d.	£	s.	d.		£	s.	d.	£	s.	d.
F. Cooper Ltd. Trust Fund .....	115	10	0				Cash in Hand Petty Cash .....	7	0	0			
Add Income .....	4	9	0				Cash at P.O.S.B. ....	645	4	2			
				119	19	0					652	4	2
J. A. Campbell Memorial Fund .....	155	1	0				Government Stock—						
Add Income .....	5	14	0				F. Cooper Limited Trust						
				160	15	0	Fund .....	100	17	6			
Sundry Creditors .....	13	15	11				J. A. Campbell Memorial						
Bank Overdraft .....	19	5	2				Fund .....	105	0	0			
				33	1	1					205	17	6
Endowment Fund .....				63	0	0	Office Furniture .....	27	0	0			
Accumulated Fund as at							Less Depreciation .....	3	0	0			
1/10/40 .....	346	0	9								24	0	0
Add Excess of Income over													
Expenditure .....	159	5	10										
				505	6	7							
				£882	1	8					£882	1	8

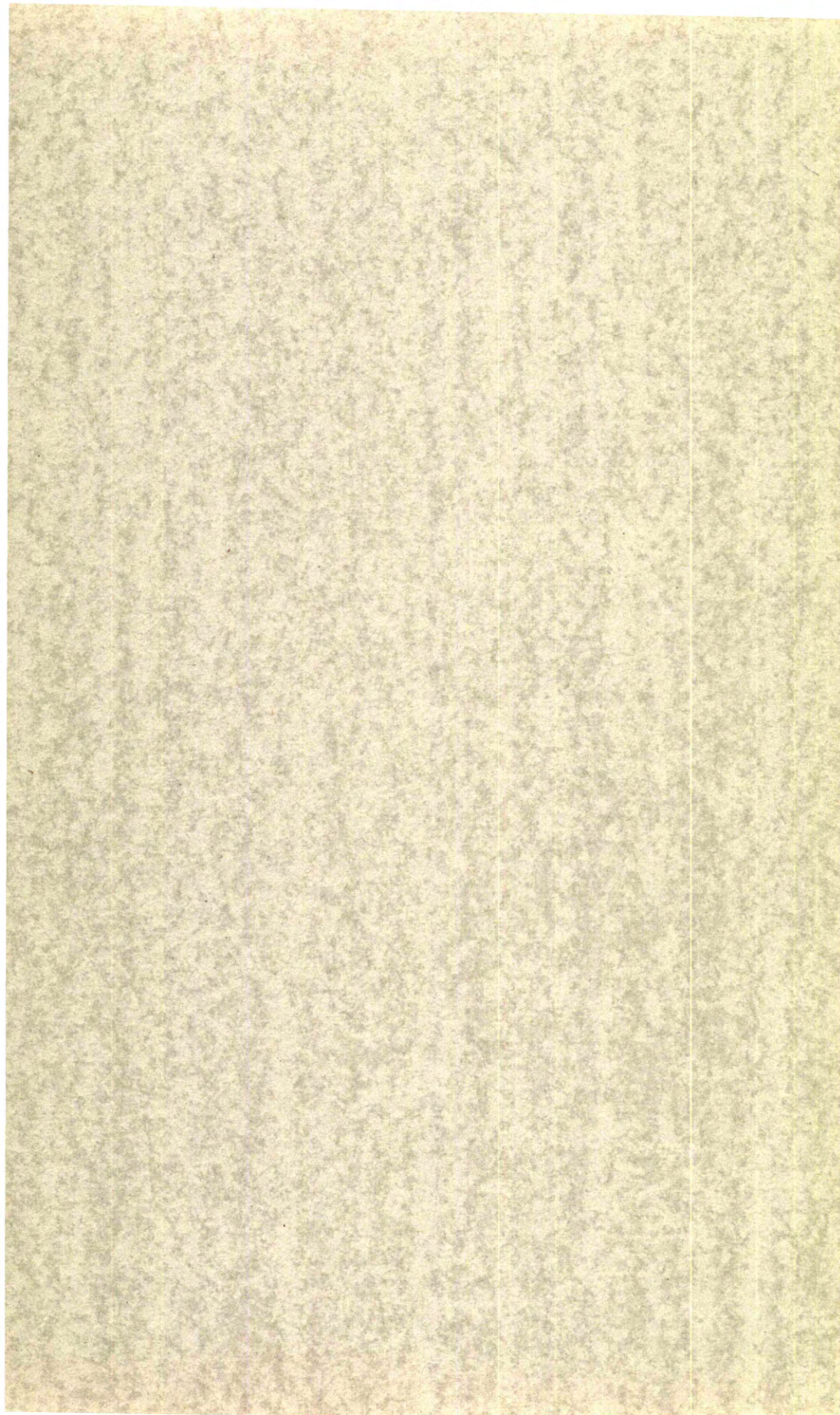
G. S. NICOLL,  
Dominion Treasurer.

I have examined the books, papers and vouchers of the Institute, and certify that in my opinion the above Balance-sheet correctly shows the position, as at the 30th. September, 1940, and the accompanying statement the transactions for the year 1939-40, in accordance with the information and explanations given to me and as shown by the books.

Wellington, 16th December, 1940.

J. L. ARCUS, F.I.A.N.Z.,  
Hon. Auditor.







# Royal New Zealand Institute of Horticulture

(INCORPORATED).

**Patrons:** Their Excellencies VISCOUNT GALWAY, Governor-General and LADY GALWAY.

**Vice-Patron:** The Hon. the Minister of Agriculture.

**President:** F. S. POPE, Esq., Wellington.

**Hon. Editor:** Dr. H. H. ALLAN, Department of Scientific and Industrial Research, Wellington.

**Dominion Secretary:** G. S. NICOLL, P.O. Box 1237, Wellington.

## **Hon. Secretaries of Local District Councils:**

Auckland: Noel Cutler, Golf Road, S.W.4.

Taranaki: L. W. Delph, M.A., Frankleigh Park, New Plymouth.

Canterbury: J. N. McLeod, 108 Paparoa Street, Christchurch.

South Canterbury: A. W. Anderson, Box 153, Timaru.

Otago: D. Tannock, 560 Castle Street, Dunedin.

Southland: K. I. Robertson, Box 44, Invercargill.

## **Membership:**

Individuals: 12/6 per annum (including Member's wife).

Juniors under age eighteen: 2/6 per annum.

Societies, Firms, etc.: 21/- per annum.

## **Journal (quarterly):**

To Members: Free.

## **Examinations:**

Examinations are held yearly in November.

Students desiring examination should make early application to

DOMINION SECRETARY,

Royal N.Z. Institute of Horticulture,

P.O. Box 1237, Wellington.

H. & P.C. Print.