

2 SUMMER
1976

Horticulture

in New Zealand

Bulletin of the Royal New Zealand Institute of Horticulture (Inc)



HORTICULTURE

IN NEW ZEALAND



BULLETIN OF THE ROYAL N.Z. INSTITUTE OF HORTICULTURE

NUMBER 2, SUMMER 1976

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Royal New Zealand Institute of Horticulture (Inc.)

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The Editor welcomes articles, letters and illustrations for consideration for publication. Deadline dates for material are: Autumn issue, February 20; Winter, May 20; Spring, August 20; Summer, October, 30. Contributions should be addressed to the Editor, Box 450, Wellington.

Views expressed in the bulletin are not necessarily those of R.N.Z.I.H.

Registered at Post Office Headquarters, Wellington as a magazine.

Aesthetics and horticulture

In this issue we feature roses. The World Rose Convention held in New Zealand in 1971 did much to promote the flower and encourage the hybridization and production of the plant. The rose has an intrinsic beauty: the shapes, colours and fragrance of the flowers establish images of perfection and joy in a society that is becoming more and more complex and crowded. And here in New Zealand the rose will almost certainly remain popular because of our favourable growing conditions. We have developed gardening as our number one recreation activity, and roses are found in many gardens.

The rose is an example of the way many plants are used in New Zealand gardens. The purpose is for display with an orientation towards the individual plant. A contrast in shape and colour, with emphasis on bigger, brighter and more showy specimens, is the main aesthetic feature. The form of New Zealand gardens derives from our European heritage and bears little allegiance to the countryside of New Zealand. The bigger, brighter, more beautiful ethic is achieved through careful cultivation — plants are hybridized, fertilized and finally pesticided.

In contrast to the intensive, urban cultivation of home gardens, we have the extensive, rural preservation of our native flora. Our native vegetation is generally isolated and viewed from a distance. With its soft, subtle textures, its stillness and evergreen character, it has a beauty of its own, an aesthetic quality, enhanced by the feelings of national pride it evokes. Some native plants are used for cultivation but generally only those that conform to the “bigger, brighter more beautiful” image are used.

Thus we have two extremes of horticultural beauty, the introduced, and the native. Should we try to compromise? Perhaps the rambling rose should be planted in native forests, but this would be ugly. We are left, then, with opposites, and ugly to each other — a kind of New Zealand aesthetic apartheid?

CHRIS HOWDEN

Trials with *Solanum* species

*Some Observations on Solanum aviculare Forst F.
and S. khasianum Clarke Grown for Alkaloid Extraction
in South Auckland*

J. A. PALMER*

Steroid drugs are used for such purposes as metabolic stimulants, stress reaction protectives, and as the basis for the modern contraceptive pill (France, 1971).

The demand has stimulated a search for naturally occurring related compounds which can be modified by relatively simple synthesis into the desired products. The discovery in certain wild Mexican yams of the steroidal sapogenin, diosgenin, which can readily be used unmodified, has led to an over-exploitation of this species and alternative sources are being sought. Among the possible alternatives currently under investigation are two New Zealand native species of *Solanum*, *Solanum aviculare* and *S. laciniatum*, and a related herb or small shrub from Northern India, *S. khasianum*. Leaves and shoots of *S. aviculare*, commonly known as poroporo, are a ready source of the alkaloid solasodine, but the berries on *S. khasianum* may be utilized more readily than the shoots of *S. aviculare*. This article describes three years' observation on 12 accessions of *S. aviculare* and some two years' observation on a small plot of single accession of *S. khasianum*.

Accessions of both species produced relatively uniform progenies, and those of *S. aviculare* may be considered as varieties.

The plots of *S. aviculare*, planted in November 1973 at Otara, were originally intended to form one replicate of an experiment planted at several locations. However, this did not materialize and hence statistical analysis of the results is not possible.

Three methods of propagation were used — direct seeding, transplanting, and semi-hardwood cuttings.

Direct seeding was unsatisfactory for *S. aviculare* because of slow, uneven germination and subsequent failure to compete with weed growth. However, this would be the suggested method for *S. khasianum*, as seed of this species germinates freely and the presence of spines makes transplanting difficult.

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Solanum aviculare

Some hardwood cuttings of *S. aviculare* but not of *S. khasianum* were used in April 1974 to replace the unsatisfactory stands in directly seeded plots. Trimmed cuttings 30 to 40 cm in length were used without any prophylactic or hormone treatment. Slightly less than half the cuttings (626 out of 1254) had rooted by September of that year.

Losses of transplanted *aviculare* seedlings, especially over the first period, varied considerably within varieties from between 11 and 98% of the transplanted stand. The losses ranged from 32 to 100% of the original stand two-and-a-half years after transplanting. So in this trial longevity of *S. aviculare* varieties was probably the most significant factor. All the *S. khasianum* seedlings survived the first winter but they showed some dieback during the second winter, when two ground frosts of round -7°C were recorded.

The major cause of dieback and death of *S. aviculare* was thought to be the fungal pathogen, *Phytophthora parasitica*. However, two separate assessments of this disease during the winter of 1974 could not be correlated with plant losses, nor could damage caused by the leaf and shoot mining larvae, *Sceliodes cordalis*. Neither was observed on *S. khasianum*.

Aviculare plots were harvested by mowing with a sickle bar mower set at about 40 cm above the ground. The shoot material was weighed

and sampled for determination of dry matter and alkaloid content. In practice it was found difficult to obtain reproducible samples for either purpose, unless they were restricted to shoot material 10 to 15 cm long. Plots were harvested once in the autumn following planting and three times during the following season.

Average determinations of solasodine in leaf and shoot material varied within varieties from 1.5% to 2.2% of the dry matter (SE \pm 0.406). Based on these figures, yields of solasodine varied in the first season from 89 kg to 197 kg/ha and in the second year from 190 kg to 356 kg/ha, but with considerable variation between harvests for each variety (CV = 23.1%). *Khasianum* was harvested whole with a forage harvester, and also as hand-picked berries. Immature seedlings, approximately 30 cm tall in late November, were found to contain only traces of solasodine (0.007% in shoot material; 0.003% in roots). At the flowering stage (January), values in shoot material had risen to 0.01%.

At the mature berry stage in March, chopped whole plant material cut with a commercial forage harvester was assessed at 0.15% solasodine. This was increased to 0.3% by excluding stalk material. Berries hand-picked at this time at the pale yellow stage contained 4.2% of dry weight as solasodine.

Weights of fresh plant material averaged approximately 8 kg/m², of which 3.8 kg was the weight of fresh berries (about 27% DM). This is equivalent to just over 10 000 kg of dry berries per hectare or an estimated yield of 431 kg of solasodine.

The ripe berries persisted on the *khasianum* bushes for more than twelve months. They became rather wrinkled in appearance and a deep orange yellow in colour. In December 1975 it was possible for the Organic Chemistry Department of the University of Auckland to harvest berries of both the current year and the previous year's growth at the same time. Alkaloids were isolated as crystalline glycosidic alkaloid from fresh material (R. C. Cambie, pers. comm.). On a fresh weight basis only, the total weights of glycosidic alkaloid extracted amounted to 0.5% for green immature berries and 2.7% for the over-mature berries of the previous season.

A second collection in March 1976 confirmed these figures. The dry matter percentage of these berries was calculated in April 1976 to be approximately 28%. This is equivalent to a solasodine yield of 4.3% of berry dry weight assuming the major alkaloid is a trisaccharide.

Thus, it would appear possible to store ripe *khasianum* berries over a period either on the plant or possibly in containers without loss of alkaloid. This would allow for winter harvesting which is not possible with *S. aviculare*.

SUMMARY

Observations on 12 accessions of *Solanum aviculare* and one accession of *S. khasianum* grown at Otara between 1973 and 1976 are reported. Neither the major pest of solanum, *Sceliodes cordalis*, nor the principal observed leaf disease, *Phytophthora infestans*, caused significant damage to *S. aviculare* and no pest or disease was noted on *S. khasianum*. However, there was considerable variation in survival of the *aviculare* accessions, final plot stands varying between 0 and 71% of the originals. Calculated yields of solasodine for both *aviculare* and *khasianum* are given but lack of replication precluded statistical analysis. *Solanum khasianum* berries can be harvested up to 12 months after they reach maturity without loss of alkaloid level.

ACKNOWLEDGEMENT

I would like to acknowledge the assistance of the Applied Biochemistry Division of DSIR, Lincoln, and of Professor Cambie, Organic Chemistry Department, University of Auckland, for the analysis of alkaloid contents of the material discussed.

REFERENCE

France, J. T., 1971: Growth of the steroid drug industry. *New Zealand Journal of Agriculture*, 125 (1): 18.

The Joys of Gorse

Gorse seems to be New Zealand's most maligned immigrant. Most farmers believe that if they could be rid of this overstayer all their worries would be over.

Even gorse has its values. Instead of repeated spraying and grubbing, why not consider the values of gorse and use it to best advantage? You may find that gorse will save rather than cost money.

Gorse is an ideal nurse crop for native plant regeneration. In unstable areas it can provide a rapid, hardy ground cover and provide shelter and the right environment for the gradual emergence of native forest. Eventually native shrub growth will suppress gorse as the canopy overshadows the straggling gorse bushes.

On steep excavated areas, and new sections exposed to wind, give a thought to the benefits which gorse provides, but be in control of the situation. In localities where gorse is a noxious weed, you don't have the opportunity, of course, to consider it at all.

Subtropical fruits in New Zealand

W. A. FLETCHER*

Surrounded by the vast mass of the South Pacific Ocean, New Zealand has a humid, equable, warm-temperate climate which in some areas verges on being subtropical and is congenial enough for a number of subtropical fruits to flourish. While New Zealand has no native subtropical fruits, they have been introduced successfully from other countries.

Some are produced commercially. Citrus fruits are well known and popular, but kiwifruit, *Actinidia chinensis*, tamarillos, *Cyphomandra betacea*, passionfruit, *Passiflora edulis*, feijoas, *Feijoa sellowiana*, and avocados, *Persea americana*, while less familiar, are becoming increasingly popular as commercial production expands.

Kiwifruit from China and tamarillos and feijoas from South America are especially interesting. Despite their overseas origins, systematic commercial production of these fruits was pioneered in New Zealand and is still largely confined to this country. Our success with exporting kiwifruit, however, is stimulating interest in growing this fruit overseas and some fruit is now being produced in California and France.

It is less than 30 years ago that the first attempts were made to produce the avocado commercially in New Zealand, but scope for expanding production is considerable and interest in this fruit is increasing rapidly.

The avocado originates from tropical America. A large, handsome, evergreen tree up to 15 m in height, it is suitable only for large gardens. The tree is extremely susceptible to root rot and succeeds only on light, free-draining soils. Varieties recommended are Zutano (June-August), Fuerte (August-November), and especially Hass (November-March), but grafted trees are in short supply.

The feijoa has spread widely from its original home in South America but is still not extensively grown commercially anywhere in the world. First introduced into New Zealand early this century, it was not until the 1930s that it came into prominence here. Feijoas propagated from seed produce very variable plants and seedlings are suitable only for hedges. For best quality fruit, grafted trees or rooted cuttings of selected strains must be grown. Several superior, large-fruited varieties such

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as Mammoth, Triumph and Coolidge are available, and research in selecting better varieties is continuing.

The tamarillo, or tree tomato as it was once called, has become a popular fruit in New Zealand but is still largely unknown overseas. Because it has only a superficial resemblance to the ordinary tomato, growers in New Zealand agreed that the name "tree tomato" was inappropriate and misleading, especially for any export development, so in January 1967 a new common name, "tamarillo", was officially approved by the Ministry of Agriculture and Fisheries. It is interesting to note that overseas authorities also appear to have accepted the new name.

Many other subtropical fruits may be found in home gardens where they not only provide interesting variety to household supplies of fresh fruit but are also interesting as ornamental plants.

The macadamia nut, *Macadamia integrifolia* and *M. tetraphylla*, an attractive evergreen tree with delicious edible nuts, originated in the coastal rain forests of eastern Australia. World-wide interest in this plant is increasing and there may be a potential for commercial production of its nuts in this country.

The mountain pawpaw, *Carica pubescens* (syn. *C. candamarcensis*), a very ornamental plant with bold foliage, gives a tropical appearance to many gardens. Its fruit has an exotic flavour and may be eaten fresh or more commonly stewed.

The Cattley guava, *Psidium cattleianum*, is a well-known, attractive shrub producing cherry sized red or yellow fruits with a sprightly flavour. The less hardy tropical guava, *P. guajava*, needs a better favoured site and its larger fruits are more palatable when stewed.

Several types of bananas are available. Edible fruit can be produced but even the warmest situations are marginal for good fruit quality. The Abyssinian banana, *Musa ensete*, grown only for ornament, is larger and hardier than edible banana plants.

The ceriman, *Monstera deliciosa*, a luxuriant climbing plant of Mexico and central America, is unusually ornamental with large incised and perforated leaves. Although often grown as a house plant, it grows well outdoors and produces an interesting edible fruit from the spadix of its large arum lily-like flowers.

Loquats, figs, persimmons and olives are hardier subtropical fruits which can feature in gardens over a wide area of New Zealand. Loquats, although native to China, are well known in the Mediterranean region. The medium-sized evergreen tree with its attractive bold foliage and small yellowish oval fruits is very ornamental. The firm juicy flesh of the fruits is refreshingly sweet-acid in flavour and the fruit is specially interesting because of its early ripening season, in late

spring. Most trees in New Zealand are seedlings. Several named varieties are known but are not yet well tested in this country.

Figs were one of the first fruits known to primitive man. These attractive deciduous trees will thrive in most parts of the country. The common fig, which develops its fruit without pollination, is the type chiefly grown. Some varieties produce two crops but all produce one main crop. The first crop is usually very sparse and ripens in late December/January. The second crop ripens from February to late April depending on variety. Seeds of the common fig are not fertile and trees are propagated from suckers or hardwood cuttings. The varieties Brown Turkey and Brunswick are recommended for all districts, but White Adriatic (the best for quality) will ripen all of its crop only in warmer parts of the country.

Only the oriental persimmon, *Diospyros kaki*, is recommended and commonly grown in New Zealand. The tree is hardy and can be grown on any well-drained soil in most parts of the country, provided a warm, well-sheltered position is chosen. Even in warmer districts the tree displays good autumn leaf colour and the yellowish fruits ripening from late autumn into winter are also very colourful. The fruits of most varieties are astringent until they are soft ripe but there are sweet or non-astringent varieties which are edible while still firm. Tane Nashi is recommended as a good, self fruitful, astringent variety. Fuyu is a non-astringent variety which performs better if cross pollinated. Titibut, a dwarf variety, is suitable for planting as an ornamental tree in home gardens.

One of the first fruits to be cultivated by man is the olive. This ornamental tree will thrive on most soils and is hardier than most other evergreen fruit species. It will survive as much frost as the loquat and feijoa. Peacock spot, a fungous disease, often causes considerable defoliation of the trees if not controlled with a copper fungicide. Insufficient summer heat appears to adversely affect cropping of olives in New Zealand but varieties recommended for trial are Mission, Verdale, Manzanillo, Barouni and Ascolano.

Other interesting, but at present less familiar fruits, include cherimoyas, white sapotes, pomegranates and pepinos. The cherimoya, *Annona cherimola*, is a semi-deciduous, spreading tree growing to a height of about 3 to 4 m. It is a native of the cool but frost-free mountain valleys of Peru and is about as hardy as the tamarillo. The fruit, which ripens during August-October, is large and heart shaped, weighing up to 2 kg or more. The flesh is creamy white and buttery in consistency with many large, dark-brown seeds embedded in it. Only seedlings have been commonly grown in New Zealand, and, although the flavour of the fruits produced is usually sweet and pleasant, it tends



Top left: Tamarillos ripening on a tree.

Bottom left: Hass avocados ripening on a tree. Avocados require a soil with perfect drainage to succeed.

Right: A cluster of macadamia nuts maturing on a branch. The macadamia is a handsome, evergreen tree that will grow in a wide range of soil types.

MAF photographs

to lack the character in fruits grown overseas. Better results are likely from named varieties which have been introduced from overseas for trial.

The casimiroa or white sapote (*Casimiroa edulis*), a native of Mexico, is a medium to large erect or spreading evergreen tree with handsome palmate leaves which will grow anywhere citrus will thrive. Its yellow-green fruits ripen in April-May and are about the size of a small orange with a thin skin and yellowish buttery pulp which is sweet and without acidity. Seedling trees are mainly grown in New

Zealand but size and flavour of their fruits vary widely. Several named varieties have recently been introduced for trial.

The pomegranate is a beautiful deciduous tree which will tolerate fairly cold winter temperatures. It is probably native to Persia but was cultivated in ancient Egypt and is now naturalized throughout the eastern Mediterranean region. The apple-sized fruit has a hard leathery rind and is filled with numerous small seeds coated with a sweet jelly-like substance. In our cool, moist climate most fruits split open on or before reaching maturity and eating quality is usually only fair. The bright red, wax-like flowers bloom throughout the summer and autumn and are very ornamental. Most trees seen in New Zealand are probably the "Paper Shell" variety but the variety "Wonderful" is superior if available. A dwarf variety that grows to about 60 cm is cultivated for ornamental purposes. It makes an attractive low hedge in summer and autumn.

The pepino (*Solanum muricatum*) is a short-lived, frost-tender, perennial shrub growing to a height of about 70 cm. It is best treated as an annual, however, and propagated from tip cuttings taken at the end of summer when the plant is growing vigorously. Seedling plants are very variable, often with poor yields and inferior quality fruit. Better yielding clones with superior quality fruit have been selected for trial.

Bulletins and pamphlets on some of the more common subtropical fruits discussed in this brief article are available from the Ministry of Agriculture and Fisheries.

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Our shrinking heritage

T. H. WARBURTON*

In the New Zealand Institute of Agricultural Science journal for November, 1974 (*N.Z. Agricultural Science*, Vol. 8, No. 4, p. 187), M. J. Leamy states: "It is a basic principle that New Zealand should use her natural resources as wisely as possible. The soil is one of the most important of these resources. . . . It is shown that 5% of the nation's soils is elite in terms of productivity and versatility and that 10% of the land area is occupied by soils of high value for food production."

It would be fair to say that the bulk of this country's horticultural production comes from the soils classified as elite, and it is around this elite soil that the battle lines are well and truly drawn to prevent increasing proportions of it being lost for ever to housing and industry.

Decisions on the change of use of this land are made by local authorities — borough, city, or county councils through their town or country planning committees. Appeal against a decision may be made to the Town and Country Planning Appeal Board.

LAND FOR FOOD PRODUCTION

There is growing unease at the part being played by town planning committees of local authorities, on the score that the personnel of committees rarely have the necessary qualifications to judge whether or not a piece of land is of a quality such as to be preserved for food production. One example recently reported is worth mention. Several objections were received to an application to change the zoning of a market garden of many years' standing from rural to residential. On this occasion the town planning and land use committee comprised five retailers and a clerk, all elected members of the council, and all enthusiasts of the "bring more people, bring more industry" policy. Their decision was that the zoning be changed, and this, in effect, meant that the market garden would be subdivided. However the objectors to the change have appealed against the decision and now the final say will be with the Town and Country Planning Appeal Board.

It is interesting to note that in this particular town there is ample second-class land still zoned rural, and plenty of subdivided, serviced sections available for prospective purchasers. But the demand is for residences on the elite land.

*Greytown.

The questions that must be asked in relation to local body town planning and land use committees are: (1) How well qualified are they to judge the food-producing potential of a piece of land? (2) Are they, in fact, able to curb their enthusiasm to "subdivide irrespective", and do they take national interest into consideration?

CLASSIFYING LAND FOR SUBDIVISION

The Town and Country Planning Appeal Board has the task of co-ordinating realistic town planning with conservation of land with high food-producing potential. It does a very good job, but, with due respect, it is suggested that the time has arrived for much more positive and defined criteria for classifying land proposed for subdivision. At present an applicant may use all the words he can assemble to "prove" that the land is of low potential for food production, and if the committee hearing the appeal is not qualified, and the objectors are not knowledgeable on the subject, the application may be granted. And a short time later a land agent advertises sections of superb quality land. The main point here is that the defining of land quality is the prerogative of a salesman rather than a scientist.

It could well be that the time has arrived for a quality listing to be applied to all land being rezoned for subdivision, and for it to be mandatory that this be done by an independent, fully-qualified, and approved person. The quality listing could well cover the following aspects:

- (1) Soil type, including suitability for food production.
- (2) Availability of water in sufficient volume for irrigation during dry periods (preferably other than water reticulated for domestic supply).
- (3) Whether horticulture or arable farming is a recognized industry in the vicinity.
- (4) Nearness to main population centres. This would take into account the need of a city like Wellington to have supply zones, such as Otaki, Levin, Greytown, fully preserved for future use, irrespective of the type of production for which the land is currently being used.

In effect, what are being suggested are criteria that an experienced market gardener, berryfruit grower or orchardist would probably use if he were seeking to establish a new production unit.

Land speculators/subdividers and land agents would probably not agree with the suggestions made here. But the point that cannot be disputed is that land is for the use of future generations as well as our own. It is our responsibility to ensure that years of potential high food production are not lost through indiscriminate subdivision.

IS OUR HERITAGE *REALLY* SHRINKING?

COMMENT FROM DIANNE MENZIES*

Mr Warburton argues that the existing system of land-use zoning in New Zealand, administered by local authorities, is contrary to horticultural and national interests.

NATIONAL INTEREST

Section 2B of the Town and Country Planning Act makes it obligatory for a planning scheme to consider agricultural (and horticultural) food production in the national interest, and to avoid encroachment of urban development on land having actual or potential value for food production. This section of the Act was introduced in 1973 for the various reasons that Mr Warburton mentions; also, recent Town Planning Appeal Board decisions have stressed the importance of productive land.

QUALIFICATIONS OF DECISION-MAKERS

The first point is that raised implicitly by Mr Warburton — who should make the decision? At present the decision-makers are laymen who seek advice from qualified people, if available. Although a market gardener would be well qualified to advise in his field, it would be hard for him to make an unbiased decision. Similarly, should only developers make decisions on suburban land, and industrialists on land zoned for industry? There are many aspects to be considered other than soil quality and, as with the jury service, an alert layman is thought to be able to make the soundest judgement.

Another aspect which should be considered is the cost of servicing the ample second-rate rural land Mr Warburton suggests should be used for housing. It may be that the cost to the community of installing sewer, water, drainage and roading facilities to a steep outlying area of a town is far greater initially, and in continued maintenance, than the alternative of developing more fertile land for housing. Would the market gardener have sufficient knowledge of these aspects to make a fair decision?

Mr Warburton claims, correctly, that increasing proportions of élite soil are being used for housing and industry, and thus lost to food production. Experts seem to differ on the suitability of soils for various users. There is very often not one, but perhaps three independent,

*Wellington.

qualified opinions. The Ministry of Works is undertaking a national land capability survey which should serve as a guide to land use.

The solution to Mr Warburton's objections seems to be either to build to a high density in towns, or to develop rougher country. But either solution raises problems for the community. Unless, through birth and immigration control, population increase is limited, there will continue to be pressure for urban housing and industry. Often the land used by market gardeners is equally attractive to industrialists (flat) and developers (flat, serviced, ideal for home gardens). Indeed, early towns have generally been established in river valleys because the land is flat, attractive in appearance, and fertile.

The horticulturist, then, must be able to compete financially with other land users. He cannot argue in the future that the community should subsidize (through acceptance of other costs) his business.

Lastly, it seems that it is market gardeners who are selling their land to the developer. Is the horticultural industry in the situation where it is more profitable to sell and move out of business? If so, we must first cure ourselves before criticizing local bodies for their part in what are, admittedly, real problems.

Floral Art

As many visitors to the National Daffodil Convention at Lower Hutt saw, floral art is strong. Joyce Benton comments: "Flower arrangement in New Zealand today is recognized as an art form, and as such is studied with regard to elements and principles of design. The trend is for less cluttered arrangements with the beauty of each individual flower and leaf being used to advantage as part of a total planned design. A thorough knowledge of plant material is required in floral art and nowadays there is an emphasis on native flora."

The Judges' and Teachers' Association, Floral Art Society of New Zealand, is on the move and membership is growing. The Wellington area recently conducted a successful day school on stewarding, scheduling and judging. Plans are under way for the first seminar of the Association. It is to be held at Massey University, February 15 to 18, 1977. For more details write to Mrs J. Vincent, 86 Kahu Road, Fendalton, Christchurch.

Tomorrow's roses?

JACK HARKNESS*

Rose breeders, with a few honourable exceptions who have taken the trouble to study the science of genetics, draw their strength from a long and intimate love affair with the genus *Rosa*. Thus they are guided to devise their crosses; and their great asset is the ability to select their seedlings, in their close knowledge and long experience of the genus. Selection in relation to breeding is much the same as eating to cooking; the product is wasted without it.

The rose has a schizophrenic following, commanding it to be florist's bloom and garden shrub alternately. It can regularly supply both demands, but may not often combine them in the same plant — which is very sensible, because what is the use of a garden shrub if you are going to cut all its flowers off?

For the best part of a century, hybrid teas have been the answer to this double demand, with, it must be admitted, a bias towards the florist. It is questionable whether their dominance can last much longer. Tastes change, and needs change, and the breeder is the person who influences change, because nobody knows exactly what will be found, not even the breeder himself, until out of his experience he one day selects it, and finds it the answer to an unarticulated desire.

The concentration on hybrid teas was natural when they were a developing class; but it is a fallacy, when it has dominated the market, to tell the breeder that only a hybrid tea is of commercial interest. That assumes a market of unchanging taste, whereas we know perfectly well that in roses there is a hunger for the novelty of change.

Lucky man, who could perceive the clues in public desire, and breed the roses to meet it! He would be a Marconi among rose breeders. What we have at present is experiment, the testing of untried combinations, in the hope that what has not been done before may yield results unseen before. It is a kind of exploration, like Columbus setting out into the unknown sea, a glorious combination of faith, hope and ignorance.

We have some fine examples to follow, and good material to use. Among modern rose breeders, the greatest has perhaps been Wilhelm Kordes, and, although he was by no means the only man to work with uncommercial rose species, he explored more of them than most people.

*Jack Harkness, Managing Director of R. Harkness and Co. Ltd, and a vice-president of the Royal National Rose Society, is without doubt one of Britain's leading rose hybridists. He is presently working with *Rosa persica*, the results of which he is sharing freely with other hybridists.

I often wonder what he did with *R. kordesii*. It is firmly fixed in his *kordesii* climbers, Parkdirektor Riggers, Hamburger Phoenix and the polysyllabic company. These have never had me agape at their unearthly beauty; nor have I any real consciousness of the benefits of that marvellous *kordesii* parentage (*R. rugosa* × *R. wichuraiana*) showing its full effectiveness yet in modern roses.

We saw a fine pink rose from Alec Cocker at the Centenary Show in London, a large flower of rose pink, coral pink and creamy pink. And here was *kordesii* progeny, taken from Parkdirektor Riggers × Piccadilly in the first instance, and led via two more hybrid teas and a floribunda back into the fold of the hybrid teas yet again.

My instinct tells me that to get the roses of the future we have to side-step the hybrid teas. Everything at present leads back to them; whether shrubs, climbers, miniatures, the demand is "Put a hybrid tea flower on them". By no means do I decry hybrid tea beauty; we want it as part of the world of roses, along with Madame Hardy beauty, Mermaid beauty. But to minister to this sophisticated, satiated age, we also need something much simpler, a target for the safety valve of sentiment.

Thus to the kit of the breeder, along with his love affair with roses, and his ability to select, we must add the gifts of imagination, and of understanding the needs of his fellow men. Who will use these gifts to the full, and give us tomorrow's roses?

PLANT PATENTS IN ROSES

Rose Introducers Rationalize Procedures

After many years of negotiation, formulation of plans, discussion, and all the backroom work that goes into instituting new legislation, an Act for the protection of breeders and discoverers of new plant varieties was passed through Parliament in 1973. Initially this protection was extended only to roses, as being a well-documented genus which could well serve as a test for the application of the new legislation.

Two years after the passing of the Act, the empowering regulations were gazetted and plant protection in relation to roses in New Zealand came into force. Although there have been some subsequent additions of agricultural crops, there has to date been no extension to other genera of direct horticultural interest.

To simplify, standardize and rationalize the procedures by which protection was implemented for new rose varieties, commercial rose

introducers convened a meeting and decided to form a society known as "The Rose Introducers of New Zealand" (R.I.N.Z.). The main purposes of the society are to ensure that a standard set of terms and conditions for all new rose introductions is formulated; and to form a single co-ordinating secretariat so that registered growers of new varieties have access to all commercial rose introductions by application to the one address, instead of having to make separate approaches to a large number of different breeders and introducers.

A further function of R.I.N.Z. is to exchange and test over as wide a range of climatic conditions as possible the prospective rose introductions of the future, and to assess, recommend and select from these trials the varieties which are the most outstanding in any year's introductions. These trials are aimed at eliminating a large number of the varieties which are placed on the market and then dropped after one or two years because they do not prove satisfactory.

The New Zealand Nurserymen's Association (N.Z.N.A.) has shown its confidence in this proposal by extending the tests within its own members and by agreeing to lend its support by promoting, publicizing and distributing the selected varieties.

Four varieties have already been selected as being the outstanding roses of those being marketed during winter 1977. They are Kapai, a brilliant orange floribunda from Sam McGredy; Scherzo, a bright red and silver bi-colour floribunda of hybrid tea form from Meiland; Precious Platinum, a beautifully formed dark red hybrid tea from Dickson; and Compassion, a fragrant hybrid tea shaped climber in apricot pink from Harkness.

The extension of protection to other horticultural genera is unlikely to occur overnight, but N.Z.N.A. and other interested groups are co-operating with the Plant Varieties Office in seeking acceptable formulae whereby an extension of the range of protected plants can be achieved as soon as possible.

P. C. GARDNER

New Zealand Tree Crop Association

The inaugural meeting of this Association was held on July 8, 1976. Any members interested in joining should write to Mr R. Endt, c/- Auckland District Council, R.N.Z.I.H., 9 Gray Crescent, Torbay, Auckland.

Roses in your town

D. C. SHEPPARD*

Probably most home gardens in New Zealand have one or two rose bushes in them, many considerably more. Some gardeners grow them well, many do not. Yet no matter how the bushes be tended or neglected, they continue to produce blooms of varying quality each year.

Why do so many people keep neglected, half-starved bushes in their gardens? Sentiment perhaps, or because the colour is attractive and the bush flowers later in the season, without any care or attention. Most people still think of the rose flower as a bloom of exquisite form and shape, with a heavy perfume, mounted on one stem — the hybrid tea type, in fact. They have never heard of the floribunda rose. But for sheer glory of colour, and fast repeating colour, combined with health and vigour, the creation of the modern hybridist, the floribunda rose, bred for massed display work, is as far ahead as the modern car is of the Ford T.

The modern floribunda came from the crossing of the older hybrid, Polyantha, with the hybrid tea rose by D. Poulsen, of Denmark, in the early 1900s, but it was not until the line had been developed to give more flowers over a longer period in the late '20s that it became popular and used for mass plantings in the "old world".

Floribundas have developed in roughly two types, the large flowering floribunda, of which Pink Parfait is an ideal, and the other, like Eurpeana, with large heads of carnation-type flowers. Both have their weaknesses. The first type often has flowers of many petals which rot easily in the wet weather, which fade before all the surrounding blooms are open, and, perhaps worst of all, take longer to repeat. So there are fewer flowering periods per season. The second type in its purest form can also be slow to repeat, as each head develops from a basal or near basal, and in wet weather the weight of water in the flower head will break the branch. Many floribunda roses grow too tall or they sprawl, and are thus no use for massed display, although they are still very admirable for the home garden.

The ideal rose bush has a compact growth habit, grows to about 60 to 90 cm in height, has the ability to shatter its old blooms cleanly, and preferably does not set seed heps — all these features combined with a strong resistance to diseases of all kind.

*68 Wynchbury Street, Spreydon, Christchurch.

In New Zealand, black spot is the worst disease in country districts; rust abounds in city areas, and mildew is common to all areas. Disease resistance is of paramount importance in modern rose hybrids. Any seedlings showing a tendency towards disease should be culled immediately, as should any that do not repeat quickly enough, unless they show some other very desirable trait.

The single or semi-single type flower, such as the Sarabande orange red, has all the desirable ingredients for a bedding rose, as it takes less time to develop and shatters easily. All Gold, a yellow, has these qualities, and the younger flowers develop very quickly below the terminal bloom, even before it has faded.

Today nurseries have available low growing, disease resistant and fast repeating floribunda roses of all hues for mass bedding displays. There are, for example, Topsy, bright red; Sunday Times and Tip Top, salmon pink; Marlina, bright red; City of Belfast, vermilion-scarlet; and now Picasso with its three colours of pink, crimson and white, to name but a few.

Rose hedges are very seldom seen in New Zealand, but in the United Kingdom and on the Continent extensive use is made of taller growing floribundas either as boundaries or to line paths. Iceberg makes a marvellous display when used for this purpose. It will reach 2 m easily if well grown and not pruned hard.

Roses could be grown much more at or near the seaside. Rugosas do quite well in sandy soils, even nearly pure sand — I recall a beautiful display of different colours growing in nearly pure sand a few hundred metres from the open seashore at Cullecoats near Newcastle-on-Tyne.

Yet another type of floribunda just appearing has a prostrate growth habit, which makes it ideal for ground cover on the flat, or planted so as to tumble down an embankment. Nozomi, with small, single, pale-pink blooms, will flower throughout December, and Temple Bells has small, single, white flowers with some repeat in autumn. A new one, from Meillands, with small, double, pink flowers is under trial now overseas. This is an interesting field for further development and no doubt there will be improvements in colour and length of flowering period. The two on the market at present need very little care — just trimming once a year to keep them within their boundaries. They could be used in median strips of highways, or to cascade down unsightly banks along roadsides.

With all these roses specially bred for mass plantings now freely available, surely the time has come for some experimenting in park and city beds. Cost is no real deterrent to such plantings, as the Scottish city of Aberdeen has proved. Here rose beds abound; every odd cor-

ner of soil has been turned into a beautiful display, ablaze with massed colour. Instead of grass verges to many busy motorways, mile upon mile of roses have been planted, in blocks of several hundred of the same variety. The median strips of some of these motorways are rose beds, too, again in blocks — and what a magnificent sight they are in full flush of bloom!

The local director of Aberdeen's Parks and Reserves Department has said publicly that the cost of the bushes has been recovered in savings on maintenance and work-hours, when compared with the same area planted in grass. The roses are tended only once a year, at pruning time when several large gangs of gardeners prune, hoe the beds, and apply mulch and spray. Lawns, on the other hand, have to be mowed every week or two, and edges cut. Plantings of annuals also worked out to be more expensive.

All the cities and towns in Scotland, England, and on the Continent use roses to a greater or lesser degree than Aberdeen, but all far more than any city or town in New Zealand.

There are many attractive beds of roses in New Zealand parks and reserves — and around sundry memorials as well as in more formal gardens — but too often the bushes are small and spindly; too often one sees hybrid teas, planted about a metre apart, with small sickly leaves, puny flowers and a lot of dead stems. This type of planting calls for the modern floribunda, planted closely, and planted in mass. A layout of four or six beds, one variety per bed, planted around a memorial or along a street is a sight to stop even the most hardened cynics in their tracks.

Yet the staff of councils and parks shy at the very mention of beds of massed roses in their reserves and streets. "They cost too much"; "They need specialist care"; "They look bare and stark for so much of the year", are frequent comments. These views may have been valid in the years before World War 2, but they are definitely not valid in the 1970s. Aberdeen has surely proved them wrong.

It is said that roses grow better in New Zealand than anywhere else in the world, so let us see what we can do with mass plantings of the modern floribunda rose.

Environment 77 — February 10-15, 1977

The Environment Centre in Christchurch, with the help of local and national environmental groups, is organizing this national conference. In the many workshops and lectures a wide range of environmental problems will be discussed.

Those interested in attending please write to "Environment 77", P.O. Box 25, Christchurch, 1.

NEW ZEALAND ROSE SOCIETY MEMBERS ATTEND OXFORD WORLD ROSE CONVENTION

The Centenary International Rose Conference, held in Oxford in July, was the fifth International Rose Conference organized by the Royal National Rose Society. Others have been held in 1928, 1938, 1958, and 1968.

A New Zealand party of 124 attended the Oxford Convention in the course of a world tour which took them first to the American Rose Society Convention in Portland, Oregon, a centre well known for its fine roses.

Over 950 rose lovers attended the Conference. The week of sessions catered for the varying interests of rosarians, from the highly scientific to the practical and the artistic. Among the subjects covered were "The Rose in Art and History", "Climbing Roses, Old and Modern", and "Stereo Photography". The practical lectures covered feeding, mulching, showing, and disease and pest control.

For many, the highlights of the Conference were the rose breeding sessions, at which speakers were Sam McGredy, Reimer Kordes, Neils Poulsen, and Pat Dickson. Jack Harkness and Alec Cocker gave a fascinating lecture on their experiences in raising hybrids from *Rosa persica*, the result of nine years' work, and were given a standing ovation. The introduction of this species into breeding should have interesting results. Both were willing to share the results of their research.

Ralph Moore, the famous American breeder of miniatures, explained his breeding programme and showed films of his new introductions. The tiny moss-miniatures, the result of fifteen years' breeding, were new to most, and quaint and attractive.

Leading English experts in floral art, Julia Clements and Howard Franklin, showed their skills in arranging roses, and there were demonstrations showing how to make rose petal wine, cooking with that wine, and how to make confectionery using roses.

During the Conference, the World Federation of Rose Societies, founded at the New Zealand Convention in 1971, held its general meeting.

Besides the week of Conference sessions, tours had been arranged to many gardens and places of historical interest within a reasonable distance of Oxford. Despite the heat, the Royal National Rose Society's gardens at Bone Hill, St. Albans, were looking magnificent, with the beds of old roses, miniatures, modern varieties, and the trial beds at their peak.

PAM MORRAH

News and comment

The Botanic Garden — A New Zealand Need

Wellington is fortunate to have a true botanic garden providing the largest single collection of native plants in New Zealand. This is the Otari Native Plant Museum. Planned as early as 1926, it has continued to grow until today the visitor is immediately impressed with the unique charm and character of a range of plants that is different from what is generally seen in our public parks and so-called botanic gardens. It represents what would be New Zealand's natural plant cover if man had not altered the natural scheme.

Outside of Otari, we see very few if any comprehensive plantings of native plants which convey their uniqueness to the beholder. Is this because the training of our horticultural personnel is still based on that of Europe and Britain in the northern hemisphere, on training from such famous places as Wisley and Kew? It is to be hoped that Massey University and Lincoln College, and students working for N.D.H. qualifications, can be inspired to study and appreciate the architectural qualities of our native plants and the unique atmosphere they can generate, so that in future they will be more evident in public gardens.

However, it is not only New Zealand plants that should concern us. With our ever-decreasing home gardens, there is a need to develop and maintain educational collections so that civic, university and government gardens may play an increasing part in our cultural life. An example is to be seen in the Royal Botanic Gardens in Melbourne where one side of a path features Australian and Tasmanian flora, the other New Zealand. All are well labelled, and constitute a true botanic garden for horticultural students and enthusiasts.

Few botanic gardens have tackled the problem of display. If museums select, display, and signpost material, so too should the botanic garden. It demands careful labelling and skilled display so that the viewer is given the ecological range, location, floral, and other features of the plant.

The desirability of New Zealand founding a National Garden along the lines of Wisley is recognized but the costs involved in such a scheme, as well as the geographic problems of the country itself, seem to preclude its establishment at least at present. However, if a policy could be established whereby main centres became responsible for developing and maintaining specialized collections of plants, the burden of costs could be spread. It is not hard to realize the importance these collections would be to professional horticulturists—a continuing source of inspiration, refreshment and knowledge. This would also

apply to the amateur, attracting to these centres visitors from both New Zealand and overseas. Government buildings and hydro-electric works, training colleges and universities could participate. A student who comes from a department with a well run botanic garden has an enormous advantage in familiarity with the plant kingdom.

We have already in New Zealand such specialist gardens as Pukeiti, Eastwood Hill, the Rose Trial Grounds, and herbaceous border collections in a few of our parks. The above suggestion would extend these and demonstrate that we have one of the finest countries in the world for horticulture.

If we as individuals wish for these things, we need to get behind our parks and government horticulturists, donate plants, assistance and knowledge, if we have specialist knowledge to offer. The experiences shared could reward all.

WINSOME SHEPHERD

Virus in Dahlias

Not so many years ago, dahlia fanciers used to claim that the dahlia was the most disease-free plant in the garden. Perhaps this was true then, but it is a statement that could well be challenged now. It is indeed a great pity that this very popular plant should have become increasingly affected by disease. It is virus diseases that I wish to discuss here — tomato and cucumber mosaics are much more prevalent now than they were a few years ago.

How do we know whether a plant is diseased or not; how did the plant become diseased; and what cure is there? The disease is usually noticeable by the plant losing vigour; the leaves become mottled and stained with yellow, and the blooms degenerate in every respect, with the colouring becoming very washed-out looking. A vigilant gardener will detect the trouble and dispose of the plant at once, and, even if he is not quite sure that the plant is diseased, he should remember the maxim "If in doubt, throw it out."

Certain varieties have a much greater tolerance to viruses than others. Though the plant is affected, the results are not readily apparent to the naked eye. These cases can be determined only by biological examination, and much of this kind of work is being done in the United Kingdom, where Roger Aylett and Terry Clarke (two well-known growers) are making great strides in keeping their stock disease free.

Virus diseases are carried from one plant to another by the gardener's knife or secateurs, but among the chief carriers are insect pests. Unless and until one exterminates the green fly family and their friends

from the garden there will always be the risk of contamination. The grower should be constantly on the lookout for disease, bearing in mind what I have already said — “If in doubt, throw it out.” Remember, there is no cure for a virus disease, and for the hopeful grower to say he has grown his plants out of it is just so much wishful thinking.

I am not suggesting that our dahlias are riddled with disease, but there is a certain amount in New Zealand. Dahlias are being imported into this country in great numbers each year, and are being distributed, in a number of cases, by gardeners without a great deal of experience in plant propagation. Some more rigid controls could perhaps do an appreciable amount of good.

Much of the incidence of disease can be laid at the feet of keen, but thoughtless growers. There are a number of such people who work in a vast quantity of assorted manures (fowl manure is the worst sinner), and keep on applying more during the growing season. The result is usually a weakened constitution in the plant, and the creation of a ready host to virus.

Remember there is no cure for a virus disease, but you can do much to *prevent* it by planting only clean stock, regular spraying against insects, and sensible cultivation. But, once again, “If in doubt, throw it out.”

J. M. MASON

The Maruia Declaration

The Native Forest Action Council, in co-operation with other environmental groups, is sponsoring a declaration on the protection and conservation of our forest resources. The declaration is based on six principles:

1. Native forests, wherever they remain, need recognition and protection in law. Today, four and a half million acres of lowland forest can potentially be logged, chipped, pulped, or burnt and converted to exotics; of this barely ten percent has any form of legal protection. Yet only the law can fully safeguard the forest heritage we hold in trust for future generations. We recognize that in special cases, departures from these principles may be justified. But we believe that the law should first provide broadly for the protection of all native forests, with the important guarantee of full public participation in all cases where exceptions are to be decided on.

2. The wholesale burning of indigenous forests and wildlife has no place in a civilised country. Almost a million acres of our remaining native forest lands are considered suitable for conversion to exotics under the new planting programme. But ample quantities of timber for New Zealand's domestic and export needs can be produced by planting open land outside indigenous forests, especially land that was unwisely cleared in the past.

3. The logging of virgin forests should be phased out by 1978. Westland is an exception; there, the regional economy still depends on some indigenous saw-milling, which must decline over a longer period while alternative industries, including exotic forest industries, are urgently developed. Again, there are a few places where it may be possible to produce high quality, decorative woods in perpetuity. But elsewhere, the logging of virgin native forests is an episode that belongs to history. Today, society's wood needs can be supplied from plantations established outside native forests. Yet indigenous sawmills and chip-mills, contributing only nine percent of our total wood production, are still being allowed to devastate more than ten thousand acres of beautiful virgin forests every year. This must be stopped. Such forests are unique and irreplaceable: those we can save now are all we shall ever have.

4. Our remaining publicly owned native forests should be placed in the hands of an organization that has a clear and undivided responsibility to protect them. It is too much to expect departments mainly concerned with wood production or land clearance to adequately protect these forests. The organization we need could be formed by taking the Parks and Reserves division from the Lands Department and the Environmental Forestry division from the Forest Service, and combining these divisions in a new Nature Conservancy charged with safeguarding all our remaining native forests.

5. To reduce commercial pressures on native forests, the growing of fine quality exotic and native timbers on land not presently forested should be given encouragement. Such timbers should not be wastefully used as they are at present, but conserved for their highest uses. Let there be more research into the nurture and growth of our native trees, and of attractive hardwood species from abroad. And as an alternative to the excessive growth of big corporate plantations, we believe individually owned farm forestry woodlots have a special role to play.

6. It is prudent to be conservative in our consumption and export of those forest products, especially newsprint and packaging paper, which make heavy demands on our precious resources of land, energy and water. If, on their maturity, we were to convert into newsprint just half the pines that were planted last year, we would have to consume for this purpose alone more electric power and water than were used last year by the entire country. Surely we must distinguish between people's real needs, and what the forest industries tell us we need. Let us conserve our resources wisely, and recycle them wherever we can.

The Secretary of the Canterbury District, R.N.Z.I.H., feels that the Institute should offer support to the Native Forest Action Council. Those interested in the wise use of our forest resources should write to Native Forest Action Council, Box 756, Nelson.

Reserves Bill

The Reserves Bill, a consolidation and amendment of the Reserves and Domains Act 1953, is at present before Parliament. There are many new clauses to the Bill, and one of the main changes is the

classification of reserves into seven different categories together with the requirement for management plans for most of these reserves.

The Bill forms the basis for the preservation and management of areas possessing potential in recreational use, protection of indigenous flora and fauna, and environmental amenity or interest.

Horticulturists interested in the public administration of reserves, especially in respect to vegetation factors, should familiarize themselves with the Bill. Submissions go before the Lands and Agriculture Committee.

Auckland Regional Botanic Garden

The October issue of the Auckland District Council's Newsletter reported on the progress of development of the Auckland Regional Botanic Garden:

The 42 ha site is at present leased for grazing except for 10 ha of native bush along the northern boundary and approximately 4 ha adjacent to Hill Rd. This area has been reshaped to provide a suitable entrance to the Garden and the first trees and plant collections have been planted here. A successful Arbor Day tree planting ceremony was held at the Garden on August 3 and was attended by representatives from several organizations. Planted in borders close to Hill Rd. are trees and shrubs which have received the "Award of Garden Excellence" and a collection of hardy flowering shrubs growing 1 to 2 m high. Close to the entrance we have planted specimen trees and a selection of medium sized trees suitable for a suburban section. The bank alongside the motorway has been planted with cultivars of New Zealand natives, and close by is a planting of natives in a natural gully containing a stream. We have planted trees alongside the motorway near the Manurewa off-ramp to provide shelter and screening.

A propagation nursery unit is being established to provide plants for use throughout the Authority as well as for the Garden. Staff facilities and a potting shed are included in the new service building which will serve both nursery and garden. We feel that the completion of this building marks a milestone in the development of the site as we now have the facilities to set up displays and demonstrations. The objective of the Auckland Regional Botanic Garden is to become a centre of horticultural activity for the region. Educational programmes and practical demonstrations based on the plant collections will help the public to learn more about plants. The layout of the Garden has been designed to allow a staged development from Hill Rd. and we plan to open the first stage in Spring 1977.

(Report prepared by Brian Buchanan.)

District news

Auckland

Auckland District Council recommends the following features for *Horticulture in New Zealand*:

- (1) A classified advertisement column for members at a nominal rate.
- (2) A list of District Councils, together with name, address and 'phone number of secretaries, this list to appear in each issue on, say, the inside back cover.
- (3) A full list of members published once a year.

We welcome classified advertisements. The charge is 5c a word.

A list of District Council secretaries is published on the inside back cover of this issue.

We shall look into the question of publishing a full list of members. Ed.

Newsletter

Auckland is producing a very successful monthly newsletter — a single sheet, printed on both sides, full of horticultural happenings in the area. The Newsletter is registered as a magazine, which means a saving of 4 cents on each copy posted. Members from other districts interested in the Newsletter should write to Mrs K. J. Veal, Secretary, Auckland District Council R.N.Z.I.H., 9 Gray Crescent, Torbay, Auckland 10.

Otago

Horticultural Training

Otago District members have again undertaken an education programme for interested young persons working in horticulture. It was decided by employers and employees to hold ten training days during the months February to November. On each day one main facet of horticulture is discussed.

Waikato

Letter to the Editor

We were interested to read the letter on capitation payable to District Councils, from Wellington District Council.

Mr Nanson and his committee are obviously at one with those members of R.N.Z.I.H. who, for as long as we can recall, have been saying that our National Executive must be strongly supported financially so

that it may press national issues of interest to horticulture at the highest level. The problem which we and many others face is finding out what these issues of national interest to horticulture might be. We do not deny that members of the old Dominion Council and of the new National Executive are dedicated men and women who support the advancement of horticulture, but to suggest that our subscriptions are really used to further major national issues seems to be totally unwarranted on the evidence of the past ten years at least. The major financial burdens for many years have been publication and administration, as a glance at any balance-sheet will show. While we do not deny that these are worthy and necessary activities, we think that unless the new National Executive can show clearly to the general members that their money is being used for the furtherance of their interests in horticulture, then the new executive will see the rapid dissolution of R.N.Z.I.H.

WAIKATO DISTRICT COUNCIL

Diploma

P. B. Bull has gained the N.D.H. (Fruit).

IDENTIFICATION OF WEEDS AND CLOVERS

BY A. J. HEALY

The first edition of *Identification of Weeds and Clovers* (1970) won widespread acclaim from those working in agricultural and horticultural fields.

This second, revised edition incorporates the plant groups of the first edition:

Clovers and clover-like plants; Thistles and thistle-like weeds; Dandelions and related rosette weeds; Docks, willow weeds and other polygonaceous weeds; Common buttercups; Rushes; Aquatic weeds.

and adds three further sections:

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The distribution of species has been updated and new species added in the sections on clovers, thistles, willow weeds, dandelions and aquatic weeds.

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