DEVELOPMENTS IN FIELD PEAS IN VICTORIA, AUSTRALIA

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The Australian Scene

The field pea industry in Australia is expanding rapidly. The total area sown to peas in 1987 amounted to 552,000 ha, of which Victoria comprised 300,000 ha, South Australia 134,000 ha, New South Wales 55,000 ha, and Western Australia 60,000 ha. The most spectacular expansion has taken place in Victoria where the crop occupied a mere 2,000 ha in 1976. The major cultivars being grown are 'Dun' and 'Dundale', the latter being a selection out of Dun. The earlier flowering 'Derrimut' is more commonly grown in Western Australia. These cultivars are purple flowered and arc of the tall, conventional leaf type. They have established a place in the export market as "Dun" peas. Cv. Dun was introduced into Australia in the early 1900s and, while newer cultivars have been developed since then i.e., Derrimut and 'Buckley' in Vict >ria and more recently 'Alma', 'Wirrega', and 'Maitland' in South Australia, there is still ample room for further improvement.

Currently in Australia there are three groups engaged in breeding field peas, headed respectively by Dr. D. N. Khan of the Western Australian Department of Agriculture at South Perth, by Dr. S. M. Ali at the Northfield Research Laboratories in South Australia, and by Dr. J. B. Brouwer at the Victorian Crops Research Lnstitute in Horsham. While these groups are aiming at different regions, they have complementary objectives and are coordinated within the National Pea Breeding Programme under the auspices of the Grain Legumes Research Council.

Yield potential and stability

Field pea breeding at the Victorian Crops Research Institute commenced in 1981 with increased potential and stability of yield as its major objectives. The cropping regions of Victoria are extremely diverse, ranging from the highly alkaline (pH 9-1 J) deep sandy loam soils of the Mallee region with its Mediterranean climate (300-350 mm annual rainfall) to the acid (pH 4-5) poorly drained duplex soils of the higher rainfall regions (550-650 mm) of southwestern and northeastern Victoria. Approximately 90% of the Victorian pea crop, however, is grown in the Wimmera, which is also the most important cereal growing region with a medium rainfall of 400-450 mm and grey self-mulching clay and red-brown earth soils of pH 7.5-8.5. It is deemed likely, therefore, that different cultivars will be required for such diverse environments. Pea crop yields fluctuate considerably across seasons, with averages in the Wimmera ranging from 0.4 t/ha in 1977 to 2.2 t/ha in 1985.

Major constraints to higher productivity are the risks of early (May) plantings being seriously affected by Ascochyta blight or damaged by early spring (September) night frosts during flowering. Radiation frosts later in the season (October-November) are rare but do occur, as was the case in 1987 when crop losses of 40% or more were recorded. The indeterminate f lowering pattern of the conventional pea cultivars is considered to add to stability of performance under these circumstances. The Victorian

breeding material is primarily based on the semi-leafless and semi-dwarf plant type as controlled by the combination of the recessive genes af and le. Since these types appear to be less flexible with respect to duration of flowering, and would thus be more vulnerable to environmental risk factors, lines having a greater number of flowering nodes are being selected.

Harvestability

The reluctance of many farmers to consider growing a crop which presents harvesting problems because of lodging, especially on stony ground, was a determining factor in the decision to concentrate on the semi-leafless and semi-dwarf plant type. Selection has recently been directed toward "taller dwarfs" in an attempt to provide an upright crop stand of firmly interlocked plants in which pod development commences not less than 30 cm from ground level. Additional straw strength has been introduced from the Ethiopian accession PS43.

The current popularity of field peas as a crop in Victoria has been greatly aided by innovative approaches by the industry such as the design of "pea fronts" on conventional harvesters which allow the pickup of the most severely lodged crops without interference from stones or standing weeds. However, improved standing ability of new cultivars still remains most important as it will result in a cleaner grain sample, a pre-requisite for a quality product.

Diseases

Of the four major foliar diseases of peas which threaten the stability and profitability of the crop in Victoria, viz. the ascochyta complex, bacterial blight, downy mildew, and powdery mildew, the first two are considered to the the most important. Ascochyta blight is caused by either Ascochyta pisi, Phoma medicaginis pinodella, or Mycosphaerella pinodes, the latter predominating in Victoria, where yield losses of up to 30% have been demonstrated. Bacterial blight is not only debilitating in terms of crop losses, but its very presence tends to exclude the Victorian harvest from certain overseas markets. While overseas data suggest that several races exist of Pseudomonas syringae pisi, very little is known of the variability occurring within this species in Australia. The race situation with respect to Ascochyta blight in Australia may be even more uncertain, not least because of the potential interaction of three different fungi.

Marketability

Dimpled seed such as that produced by the Australian cultivars Dun and Dundale is not favored by pea processors because of the difficulty in removing the seed coat from the indented spots. Advanced pea lines are now being tested having the desirable large round seed and white seed coat and which produce either yellow or green split peas. Discoloration or "bleaching" of blue peas or dry green peas can also be a problem in most Victorian districts, and further testing is required to determine whether the selected lines have sufficient resistance to "bleaching" under the agronomic practices currently followed by commercial pea growers.

Breeding methodology

The pea breeding strategy is based on an ideotype approach and has so far focused on genes to improve plant type (semi-leafless, semi-dwarf) and seed type (white seedcoat, roundness), while retaining adaptive genes (flowering time, early vigor) derived from well established cultivars through backcrossing and convergence crossing. Yield improvement is being achieved by this approach, but the high degree of backcrossing required may not be compatible with widening the genetic basis of the choice of cultivars commercially available to Australian pea growers. The vulnerability of large cropping industries based on a few closely related cultivars is well documented and consequently the rapid expansion of the area devoted to field peas in Australia requires that increased attention be given to the use of exotic parents, wild types or cultivars, which can be expected to have diverse genetic origins.

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