CHICKPEAS

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ABSTRACT

Chickpea (*Cicer arietinum*) is a crop with potential for local consumption and export both as a human food and animal feed. Chickpea also is a good supplier of nitrogen to following crops. Australia has taken up this challenge and has developed an industry along all five lines given above, producing information and varieties of interest in New Zealand. Local fine tuning of the agronomic package and selection of varieties that encompass agronomic (frost tolerance) and market advantages (e.g. large seed size) is needed and is taking place in a relatively small way at present. The crop has good prospects for expanded production in New Zealand.

Additional Key Words: Bengal gram, Desi, Garbanzo, Kabuli.

INTRODUCTION

Chickpeas are a crop showing great potential for production in New Zealand. Seventy tonnes of the large seeded (Kabuli) types are imported annually into New Zealand for human consumption (Deptartment. of Statistics, 1989). There are also substantial potential export markets available as indicated by the expansion of production in Australia. These markets are for both the large and small (desi) seeded types for both human consumption and potentially for animal feed production.

Quality is an important factor in production for local human consumption. For instance, Macareena chickpeas grown in the Ord Irrigation Aarea, have captured about 50 % of the local Australian market due to their very large seed size (600 mg - 640 mg/seed) compared to Opal (400 - 500 mg/seed). With different lines showing variations in anti-nutritional factors and digestible energy content, choice of appropriate varieties is also important in the animal feed industry. Little research has been carried out in New Zealand. Some agronomic work has been conducted at Lincoln University (Hernandez, 1986) and some variety work is being conducted by the Crop Research Division of the DSIR at Lincoln (W. Jermyn, personal communication).

NEW ZEALAND RESEARCH

Suitability of the crop for production in New Zealand has been assessed by Logan (1983), Farnsworth (1985) and Hernandez (1986). Breeding research and cultivar evaluation is continuing at Crop Research Division, DSIR, Lincoln (Jermyn, pers. com.). A major objective is to obtain frost tolerant and disease tolerant, high yielding large seeded kabuli types. Hernandez & Hill (1983, 1984, 1985) showed that 33 plants/m^2 were adequate for maximum yields in both desi and kabuli type chickpeas under Canterbury conditions (2.1 - 2.7 t/ha) with a 29 % increase in yield resulting from inoculation. Work elsewhere has suggested for kabuli types even lower populations at 12 - 14 plants/m^2 are adequate for maximum economic yield (McNeil, 1988).

Ascochyta blight was a major problem with the crop particularly during the cool wet 1984 season.

September sowing proved to be optimal, achieving maximum light absorption and maximum yield (Hernandez & Hill, 1985). However, this may not always be the case as low soil temperature may inhibit and slow germination leading to poor establishment. This is a consistent problem in chickpeas, particularly the large seeded types.

AUSTRALIAN RESEARCH

Weed control: Slow early crop growth can create major problems in weed control of chickpea crops. Broadleaf weeds are the most serious problem and several strategies have been developed for their control.

Good broadleaf control in a preceding cereal crop has been found to help and in some regions (McNeil & Heap, 1986) a mixture of Trifluralin plus interrow cultivation has given good weed control in conjunction with a paraquat plus diquat spray between sowing and emergence.

Post-emergent fluazifop for grass weed control is registered for use in Queensland.

Experimental work in Victoria has suggested Bladex at 3 l/ha gives good broadleaf weed control and yield increases. Sencor T and Igran were somewhat less effective (Mahoney, 1984). None of these chemicals can however be recommended as yet in New Zealand.

Plant nutrition: Chickpeas have been shown to respond to S, P, Zn and Fe though they are less responsive than other legume crops (Saxena, 1980, Reuter, 1986).

There are some indications that late applications of N benefits vegetative growth but not yield (Hernandez & Hill, 1984; Riley *et al.*, 1987).

Chickpeas are efficient nitrogen fixers of and have given carry-over residual effects in New South Wales and Queensland equivalent to 50 to 100 kg of N/ha (Strong *et al.*, 1986; Armstrong, 1987).

Time of planting: Experiments in Victoria and New South Wales have indicated that autumn and winter sowing of chickpeas gave maximum yields in those environments (Pye, 1989 unpublished) provided frost tolerant genotypes were available.

Water use: Chickpeas, like many other legumes, are extremely sensitive to waterlogging and poor soil structure. Experiments have demonstrated substantial benefits from deep ripping and improved yields with reduced irrigation frequencies where soil roots could obtain greater volumes of water from depth (Riley *et al.*, 1987).

Chickpeas are capable of excellent growth with little water, however, well watered crops give optimal yields (McNeil *et al.*, 1986) provided leaf and root diseases are controlled.

Diseases: Elsewhere chickpeas are subject to a broad range of leaf and root diseases. Major leaf diseases in Australia are Botrytis grey mould (*Botrytis cinerea* Pers. ex. Fr). Sclerotinia stem rot (*Sclerotinia sclerotiorum* (Lib.) de Bary, *S. trifoliorum* Erikss.), Ascochyta blight (*Ascochyta rabiei* (Pass.) Labr.). Phoma blight (*Phoma medicaginis* Malbr. and Roum.) and bacterial blight (*Pseudomonas andropogonis* (Smith) Stapp.). Most of these diseases can be controlled by use of disease free fungicide treated seed and crop rotations. Wider row spacings to produce less humidity in the crop may also help (Bretag & Mebalds, 1987; Haware *et al.* 1986; Jiminez-Diaz & Trapero-Casas, 1985).

The major chickpea root disease in Australia, Phytophthora root rot, *Phytophthora megasperma* (Drechs) f. sp. medicaginis, Kuan & Erwin is only important in Northern Australia. Seed dressing, use of phosphoric acid sprays and host resistance can all be used in its control (Ryley & Irwin, pers. com. 1988). To date the other major root disease of chickpeas *Fusarium oxysporum* f. sp. *Ciceris* has not been recorded in Australia or New Zealand. A broad complex of other rots e.g. *Rhizoctonia, Botrytis, Pythium, Fusarium, Sclerotinia* can cause seedling and adult plant deaths. Most of these can be controlled by seed dressing.

Viruses cause severe losses in some regions in some years. However, at present they do not appear to be a major problem (M. Schwinghamer, pers. com. 1988).

Insects: Chickpeas usually have a coating of oxalic acid on their leaves which discourages many insect pests. However, this can lead to uncontrolled population explosions of resistant pests as natural predators are not present. This appears to be the case in Australia with *Heliothus* sp. which is a major problem (McNeil & Heap, 1986). Soil insects may also be a problem and can cause seed and seedling losses, by damage and infection by fungi (Riley *et al.*, 1987).

There is a large literature which covers chemical, virus, pheromone and integrated control strategies for Heliothus.

Root nematodes have also been implicated in yield losses of chickpea particularly the root lesion nematode *Pratylenchus thornei* (Walia & Seshadri, 1985 a, b).

Quality: Most chickpeas are semi-prostrate in habit requiring harvest close to the ground or windrowing prior to harvest. As soil and split seed tolerances may be low for export markets (e.g. none and 2 % for the Spanish market) and seed discolouration can also be a problem in kabuli types, care must be taken throughout the production and marketing chain to reduce these problems.

Genetic Resources: Major world germplasm collections for chickpeas are held at ICRISAT (India), USDA (USA), ICARDA (Syria), and ATFCC (Australia). A major breeding programme in Australia

exists at Tamworth, in New South Wales. The Crop Research Division of the DSIR is involved in evaluation of genotypes. Lincoln University also has an interest in evaluation of autumn sown *Kabuli* types in collaboration with ICARDA.

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