Phacelia: Some management notes

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Abstract

During the 1990/91 season, four Canterbury-based companies were given the opportunity to multiply seed of *Phacelia tanacetifolia* for European interests. Phacelia is a very striking crop in the field, with deep blue flowers and a strong, pleasant aroma. These features, along with the newness of the crop, created some public interest. Subsequent events have indicated the crop may not be grown commercially in New Zealand in the near future due to a limited demand from Europe. There may however be some potential for Phacelia in New Zealand as bee forage, a green manure, sheep forage and aphid parasite host. This paper seeks to document what was learnt about seed production in Phacelia.

Additional key words: Phacelia tanacetifolia, *seed production, crop management*

Introduction

There are about 200 species in the *Phacelia* genera, some perennial and some annual (Cazzola, 1987). As a commercial species *Phacelia tanacetifolia* has long been recognised by beekeepers as a preferred foraging plant for honeybees (Teittinen, 1980) with a high potential for honey yield (Orsi and Bionoi, 1987).

Phacelia has also been used as a green manure crop in Europe for a number of years (Anon., 1989). When ploughed in regularly as a green manure, increases in soil carbon and nitrogen content to over 80 cm have been measured (Beckmann, 1977). The crop is also reported to have nematicidal properties, (Cazzola, 1987; Anon., 1989; Booker Seeds, 1990) although it was not clear whether this is by means of a break crop or whether the root system was actively nematicidal.

Phacelia has also been used as a forage crop, either on its own (Danial and Zobelt, 1986) or in a mix with peas or vetch to provide forage and honey production (Petkov, 1966). Phacelia has been found to have high energy and protein content, but some questions were raised about possible allelochemical properties of the plant (Danial and Zobelt, 1986).

Phacelia has been recorded as being a host plant for aphid predators in sugarbeet (Senegonca and Frings, 1988) and wheat. Syriphidae, Carabids, Coccinellids and Chrysopids (all aphid predators) were all encouraged by the planting of *P. tanacetifolia* (Senegonca and Frings, 1988). Thus there may be some potential as a biological refuge for predatory insects. However, there is also a reference made to a potential carryover of soil pathogens *Rhozoctonia solani* and *Pythium* with the use of Phacelia as a green manure (Krober and Beckmann, 1975). Krober and Beckmann indicated that Phacelia is susceptible to 'damping-off' due to these diseases and hence may carryover these diseases into other crops.

Phacelia is reported to be frost sensitive (Booker Seeds, 1991; Anon., 1989) and hence for seed production the crop was generally planted later in the spring. This reported frost sensitivity was not observed in New Zealand. Phacelia is commonly established quickly after the harvest of the main crop, to maintain soil structure, fertility and to protect the soil surface (Mariander *et al.*, 1981). Establishment is rapid and the crop quickly covers the ground (Ibid.) and may reach 90 cm in height (Cazzola, 1987)

Management Notes

During the 1990/91 season, each New Zealand company dealt with separate contacts in Europe, and each was furnished with different notes on growing (Booker Seeds, 1990; Green, 1990). The following notes summarise the information obtained during the 1990/91 season, from information supplied by Booker Seeds and Green, together with observations by the author and other contributors. As very little formal research has been carried out the information should be regarded as only preliminary.

Sowing date

All New Zealand crops were spring sown from August to late October 1990. Initial fears that the crop

was frost sensitive (Anon., 1990) were unfounded in New Zealand conditions. Some self-seeded crops were observed over the following autumn and winter and while growth was slow, no obvious winter die-back was apparent. No specific time of sowing was identified as being optimum for yield due to the significance of other factors. Mid September to early October crops were observed to establish well and produce good seed yields.

Paddock selection

Phacelia has a long fibrous root system as well as a main tap root. It is claimed to benefit soil structure and also to have nematicidal properties (Cazzola, 1987; Anon., 1989). MAF Technology Lincoln have included Phacelia in trials evaluating the restorative properties of a number of crops (Francis, G. *pers. comm.*, 1991).

However, for seed production in New Zealand, it would seem unwise to sow the crop in depleted, poorly structured soils. The speed of growth of the crop indicates it would require optimum soil conditions. Poorly structured and/or compacted sites should be avoided, and may in fact create problems with seedling damping off (Krober and Beckmann, 1975).

Problem weeds observed in the field were fathen (*Chenopodium album*) and nightshade (*Solanum nigrum*) while wireweed (*Polygonum aviculare*) and willow weed (*Polygonum persicaria*) were seed dressing problems.

Thistle seeds were also a problem in two of the seedlines and paddocks with known high levels of these weeds should be avoided until appropriate chemical control is identified.

Sowing rate and depth

Pyne Gould Guinness conducted initial trial work on Phacelia in the early to mid 1980's. One of the trials investigated the effect of sowing rate on plant population (Table 1).

One company used 4 kg/ha sowing rate while two others used 8-10 kg/ha. It is suggested that the lower rate is a more appropriate rate when establishing a green manure crop, and rates of 4-7 kg/ha for green manure were noted in some European literature (Cazzola, 1987; Anon., 1989). It should be noted that Phacelia is an indeterminate plant, and that by using a higher rate, the grower should be able to increase inter-plant competition and hence tend to compress the flowering period. Phacelia flowers over a 38-45 day period (Orsi and Bionoi, 1987).

Table 1. Effect of sowing rate on plant population.

Sowing rate (kg/ha)	Established plant population (plants/m^2)
5	55
10	84
15	150
20	184

The general recommendation was to sow at a depth of 1-2 cm, and some field observations were made which indicated the crop was sensitive to either being sown too deep or too shallow.

Certification

At least one company arranged to have the crop certified to First Generation status, and MAFQual (Christchurch) have some descriptive information. Data supplied by Pyne Gould Guinness Ltd. suggested that the minimum distances between Phacelia cultivars should be 400 m for basic seed and 200 m for certified seed.

These figures should be checked by anyone considering certification. It is presumed that the proposal by Cazzola (1987) to have Phacelia included in the compulsory certification list has not yet been enacted due to the lack of equivalence regarding certification with the EEC.

Fertiliser

The crop is capable of very rapid growth. Fertiliser input would depend on paddock history, but it seems advisable to sow into fertile, well structured seed beds. The general recommendation was for an input of 40-60 kg N, 15-20 kg P and perhaps some potassium depending on soil type and cropping history. A starter of 200-250 kg/ha. Crop 20 or Crop 15 at sowing with the possibility of a top-up of nitrogen once the plant is at the rosette stage. (Green, 1990; Stevenson, 1990).

Weed control

Without doubt, the best location for the crop is one which has a minimum of weed pressure. During 1990/91 Treflan (Trifluralin) Linuron and were used extensively on the crop as pre-plant and pre-emergence treatments. Grass control with Fusilade (fluazifop-P-butyl) was also effective. One suggestion was made for the use of Lontrel (Clopyrolid + MCPB) and for Versatil (Clopyrolid). Products known to kill Phacelia include MCPA, Gesagard, Gardoprim and Glean.

Phacelia has the potential to become a weed, although its sensitivity to the above chemicals suggests this may

not be too severe. The half life of the seed in the soil is unknown.

Pests and diseases

No obvious pest or disease problems were encountered. One company involved with the 1990/91 multiplications believed there was a disease present in the head during flowering and that this disease may have spread to the seed. There was no positive diagnosis made and it is suggested that future growers monitor closely for any disease.

Irrigation

Some of the European literature suggested Phacelia was tolerant of drought, (Anon., 1989) but this would probably be under European conditions. The speed of growth and the luxuriant foliage (similar to carrots and hemlock) suggests the crop would have at least modest moisture requirements. One company suggested that high levels of irrigation were required to maximise yield, but was unable to provide substantive data.

Growth and flowering habit

Phacelia emerges in moderate time (10-14 days) but appears to stop growing for a short period once about 10 cm tall. This is the beginning of the bolting phase, and flowering begins at the apex once the stems are about 30 cm tall. The seed head continues to flower and set new pods continuously, so it is flowering at the apex over a long period while seeds in pods below the flowers are maturing.

The indeterminate flowering, coupled with easily shattered pods, present a major harvesting problem with Phacelia.

Crop establishment should be aimed at uniform plant emergence at reasonably high plant populations to attempt to compress the flowering as much as possible. The objective is to produce seed of even maturity.

Pollination

Bees are required for maximum seed set in Phacelia, however the crop is highly attractive to bees. About 2.5 hives per hectare should be provided if there is no bee source nearby.

Harvesting

The harvesting of the crop was the biggest determinant of seed yield. Three procedures were used.

1. Direct threshing when the optimum number of ripe grains were present.
2. Pre-harvest desiccation with Preglone prior to windrowing and threshing.
3. Windrowing and then threshing 5-10 days later.

Opinion was divided as to what was the most successful method, however it was clear that direct heading was the least successful.

The key to any technique is regular monitoring, up to 2-hourly during the critical final stages. Harvesting must begin as soon as the crop is fit, as a delay of only a few hours can see significant volumes of seed lost through shattering. Some loose seed remains in the foliage of the windrow, and a canvas front on the header would improve the recovery of this seed. Selecting a sheltered site decreases the chance of excessive loss through wind-damage and shattering of the pods.

Most of the harvested seed required ventilation post harvest due to the amount of vegetative matter collected with the seed. Maximum temperature recommendation is 30°C with a target seed moisture content of 12%.

The large amount of vegetative material with the seed means, there is a need for experimentation with dressing techniques and selection of riddles. A number of lines were dressed twice.

It was rumoured that a number of lines of Phacelia grown in 1990/91 suffered from poor germination (below contract specifications of 85-90% germination). Potential causes of low germination may have been:

- Uneven maturity in the head through extended flowering
- Non-diagnosed disease
- Heat damage during storage or drying
- Damage during dressing

Yields of between 100 kg/ha and 800 kg/ha MD seed were reported, with an average of around 400 kg/ha MD. Cazzola (1987) reported potential seed yields of 1000-1500 kg/ha, which would possibly be attainable if all seed could be harvested and losses through uneven maturity and/or shattering were minimised.

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