

Crop Strategies: Allium crops

Introduction

The outline covers non-chemical methods of controlling weeds in onion, leek, and garlic grown as vegetable crops under UK conditions. Allium crops may be grown from seed (onion, leek), transplanted from a seedbed (leek), raised as single (onion, leek) or multi-seeded (onion) modules for later field planting, grown from 'sets', i.e. small bulbs specially grown from seed (onion), or vegetatively propagated by division of bulbs (garlic). Onions can be further subdivided according to the time and manner of harvesting. Sown crops of appropriate cultivars may be harvested early as 'salad onions' or as small bulbs for pickling, while the main onion crop, whether grown from seed or sets, is harvested as fully-grown bulbs.

Allium crops germinate and grow slowly, they generally have rather few leaves and for most of the growing season the soil is not fully covered. Weeds can therefore germinate over a long period. Allium crops are also very sensitive to weed competition, so weed control is of particular importance. Weeds are more of a problem in crops grown from seed than in transplanted or vegetatively propagated crops. At crop harvest, weeds foul undercutting and lifting machinery and prevent onion bulbs drying in the windrow.

The basic strategy for weed control in Allium crops starts with the choice of the field. The structure of the soil is important, and so is the preceding crop. The preparation of the seedbed is also a very important part of any weed control strategy. The seedbed should be fine, crumbly and level. Allium crops should not be sown or planted too early, otherwise the crop will grow slowly, giving the weeds the advantage of a longer germination period. Because perennial weeds are very difficult to control in Allium crops, they have to be controlled in the preceding crop.

Crop establishment generally follows conventional primary and secondary cultivations. The main methods of weed control are mechanical and thermal. Mechanical control includes harrowing and hoeing, while thermal control involves flame weeding to control small seedling weeds. The success of these methods depends on timing, on weather and soil conditions, and on the composition and density of the weed population.

Onions

Onions require a soil pH between 6.2 and 7.5 on mineral soils, or 5.4 and 7.5 on peat. Onions ripen later and more slowly on soils with high organic matter content. Stones can cause problems at drilling and at harvest. Good drainage is essential but onions need moisture throughout the growing period and soils must have good water holding capacity. Uneven application of irrigation water can cause erratic emergence, growth and ripening and it is preferable to use soils where irrigation is not needed. The land should be free from couch, docks, creeping thistle and other perennial weeds.

Onions may follow cereals, a ley, a green manure or certain vegetable crops in the rotation. They should not follow crops attacked by the same strain of stem and bulb eelworm (i.e. Oats, clover, lucerne, sugar beet, leek, carrot, parsnip, pea,

broad bean, dwarf bean, rhubarb, strawberry, daffodil, tulip). Potatoes can precede onions but volunteer potatoes can become a serious weed problem.

Bulb onion

Bulb onions may be direct-sown, module raised in multiblocks for transplanting, and grown from sets. Direct drilling is cheaper but there are higher weeding costs. Sowing dates are from late-February to March for harvesting in September. For a spring-sown crop it is necessary to prepare a good seedbed in late February or the first three weeks of March. On heavy soils it is only possible to do this if ploughing is done at the beginning of winter to get good weathering. It is important therefore to have time after harvest of the preceding crop to allow early winter ploughing. In spring, if soil dries out in a lumpy condition it can be difficult to produce a good tilth. In poor conditions, sowing may be delayed until mid-April but lower yields can be expected. The period between sowing and emergence of March-sown onions is from three to six weeks depending on weather conditions.

Row width is 30-45 cm with 4-5 rows per bed and plant density 50 plants /m². In practice, row width will be determined by the minimum row width required by implements to be used after sowing. Adequate allowance should be made for tractor wheelings for repeated mechanical inter-row hoeing operations. Mechanical weeding options may depend on soil type.

The traditional system of harvesting involves, undercutting and windrowing as soon as the tops go down. In drying weather onions are left in the windrow until tops have wilted (5-10 days). Onions should be off the field before mid-September to ensure best quality. Onions can then be picked up and loaded in store for drying. Alternatively the standing onions may be topped in the field and harvested directly. The tops are removed with a flail type machine. These onions need drying in store. Sprouting of bulbs in store is encouraged by early defoliation.



onion bulbs with weeds

Weed control

The preparation of a false (stale) seedbed is unlikely to be practical in the spring-sown crop but the period from drilling to crop emergence is usually long enough to provide an opportunity to kill early emerging weeds before the crop emerges. If conditions allow, delayed drilling of the crop gives weeds more time to emerge and be killed by flame weeding before crop emergence.

Secondary cultivations prior to planting sets or modules may kill emerged and germinated weeds but success depends on soil conditions. Cultivations should be kept as shallow as possible to avoid stimulating further weed emergence. Flame weeding will kill seedling weeds without disturbing the soil.

Hand-hoeing between the rows may be used during early crop establishment, and later hoeing and hand weeding within the rows may be needed. Labour estimates of 150 man h/ha have been suggested.

Inter-row cultivations with brush-weeders, finger-tine weeders, harrows or tractor-drawn hoes will control weeds within the crop row. The number of passes will depend on the weed population.

Thermal weed control may be used with care pre- or post- crop emergence or pre- and post-planting to kill seedling weeds. It is safer to use shields or direct the burners away from the crop row so the flames only come into contact with the base of the onions. Onions have some tolerance to flame weeding due to their basal growing point but tolerance may depend on crop growth stage. Onions at the crook stage can be killed. In set onions, flaming has been carried out when the onions were 5, 20 and 40 cm tall. Yield was lower with machine-planted than hand-planted onions after flaming. In the drilled crop flaming pre-emergence and when the onions exceeded 15 cm height did not affect yield and reduced the labour requirement for hand-weeding more than inter-row cultivation. Grass weeds share the same basal growth habit and are tolerant of flame weeding too. Perennial weeds are unlikely to suffer any long-term damage from flaming either. The tolerance of most weeds increases with age.

Overwintered onions are likely to suffer a heavy weed burden from both autumn and spring flushes of weed emergence. Long-term weed control may be achieved by planting onions into black plastic mulch. This may be relatively easy to establish over small areas but field scale production is more difficult.

The optimum timing of weed removal in module-raised onions is more flexible than in the drilled crop. A single hand-weeding at 5, 6 or 7 weeks after planting have all been effective in preventing crop losses due to weeds.



onions and some weeds

Salad onion

Usually cultivars of *Allium cepa* are grown but *A. fistulosum*, the bunching onion, is sometimes grown but may have limited winter hardiness. Salad onions are grown on a range of soils from loamy sands to very fine loamy sands but require a soil pH not less than 6.5.

Salad onions are direct-sown sequentially through the growing season. Sowing dates should aim for continuity of production. Seed is drilled successionaly from February to September at 2-3 week intervals. A row width of 300 mm may be used for single rows, but closer spacing down to 100 mm is used in some instances. Multiple drills, double or triple, 50-70 mm apart can be grown at 300-360 mm row spacings. Depth of sowing should be sufficient to cover seed unless conditions are dry, when the seed should be drilled deeper. The maximum plant population required is 430- 450 plants/m². Seed rates range from 20-28 kg/ha. Seed counts range between 2100 and 3400 seeds per 10g. At harvest salad onions are usually bunched in the field, then taken and washed and trimmed elsewhere before being packed in containers.

Weed control

The preparation of a false (stale) seedbed will reduce weed numbers in the growing crop. Secondary cultivations following the false seedbed will kill emerged and germinated weeds prior to crop sowing but success depends on soil conditions. Cultivations should be kept as shallow as possible to avoid stimulating further weed emergence. Flame weeding will kill

the emerged weed seedlings without disturbing the soil but may not affect germinating weed seeds beneath the soil surface.

A similar effect may be achieved by delaying drilling into a prepared seedbed so that more weed seedlings emerge before the crop. The seedlings can then be killed by flame-weeding. Timing is critical to ensure the maximum number of weeds are killed before the onions begin to emerge. Failure to kill the weeds will lead to a serious weed problem.

Hand-hoeing between the rows may be used during early crop establishment, and later hoeing and hand weeding within the rows may be needed. Labour estimates of 150 man h/ha have been suggested.

Inter-row cultivations with brush-weeders, finger-tine weeders, harrows or tractor-drawn hoes will control weeds within the crop row. The number of passes needed will depend on the weed population. Intra-row weeding is likely to be more difficult with multiple or broadcast crop rows

Thermal weed control may be used with care pre- or post- crop emergence or planting to kill seedling weeds. It is safer to use shields or direct the burners away from the crop row. Onions have some tolerance to flame weeding due to their basal growing point but tolerance may depend on growth stage. Grass weeds share the same growth habit and have some tolerance of flame weeding. Perennial weeds are also unlikely to suffer any long-term damage. The tolerance of most weeds increases with growth stage.

The optimum time for weed removal is difficult to specify because the crop is drilled at intervals through much of the growing season. The optimum time for a single hand-weeding varied between 21 and 56 days after 50% crop emergence. Crop sowing date and weed density and pattern of emergence all had some effect on weeding time. A single weeding at 28 days after 50% crop emergence was the most consistently effective. Inter-row cultivations alone did not prevent yield loss.

Leek

Leeks grow satisfactorily on many soil types but deep fertile loams are best for producing good yields of high quality produce. Good drainage is essential and the soil should not be compacted. The pH should not be less than 6.5. Leeks respond well to generous applications of bulky organic manures, even when soil fertility is high. Leeks usually follow a cereal or another vegetable crop in the rotation but not onion.

Leek crops may be direct drilled in the field but are usually sown in seedbeds for subsequent transplanting, or sown in modules under protection for planting out later. As with bulb onions, weed control in the drilled crop is more difficult to achieve. Leeks sown under protection in January/February can be harvested in August. Leeks sown outside in frames or direct drilled from February to early March will be ready to harvest by early September. Sowings made up to late April

will have lighter yields but may stand better through the winter.

Leeks are drilled in rows 27.9 to 30.5 cm apart, or 45-50 cm apart so that stems can be earthed up in late-summer / autumn. Where leeks are grown in wider rows, soil can be worked towards the plants later in the season to improve weed control and increase the length of blanched stem. Small leeks for pre-packing may be spaced 3-8 cm apart, market leeks are spaced at 7-8 cm in the row.

The earliest leeks come from sowings made in a heated greenhouse in January or February, for transplanting in May-June. Later sowings may be made in cold frames or in the open for transplanting in June-early July. Leeks transplanted as late as July or even August may produce a marketable crop.

Drilled leeks lifted from a seedbed are trimmed before transplanting in the field. The roots are shortened to 2 cm and the leaves cut back to ease planting. Best establishment comes from 10-15 wk old transplants as older plants often suffer a growth check. The leeks are planted 12-13 cm deep either by hand or machine. Irrigation after planting ensures good establishment.

Leeks are harvested September to May. The choice of cultivars is important to ensure continuity of production throughout this period. Crop specifications will depend on the intended market outlet and this will also influence the cultivars that are grown. Leeks are lifted by machine or hand-forked. Machines may simply loosen the crop for hand-pulling, or may lift the crop completely. Some machines will also trim the leeks. Skinning of the dirty outer leaf sheath, and rough trimming of the leaves and roots is generally carried out in the field.



weedy leeks



weedy leeks at harvest



final harvest leeks

Weed Control

The preparation of a false (stale) seedbed is unlikely to be practical in the direct-sown crop but the period from drilling to crop emergence is usually long enough to provide an opportunity to kill early emerging weeds before the crop emerges. If conditions allow, delayed drilling of the crop may give weeds more time to emerge and be killed before crop emergence.

For the transplanted crop, the use of a false seedbed prior to planting will reduce weed numbers in the growing crop. Secondary cultivations prior to planting bare-root or module raised leeks are used to kill emerged and germinated weeds but success depends on soil conditions. Cultivations should be kept as shallow as possible to avoid stimulating further weed emergence. Flame weeding will kill the weeds without disturbing the soil but may not control germinating weeds below the soil surface.

Hand-hoeing between the rows may be used during early crop establishment, and later, hoeing and hand weeding both between and within the rows may be needed. Inter-row cultivations with brush-weeders, finger-tine weeders, harrows or tractor-drawn hoes will also control weeds within the crop row. The number of passes will depend on the weed population. With many of these implements the soil may be directed towards the crop row to bury small intra-row weeds as well as improving stem blanching. Care should be taken not to get loose soil down within the crop leaves. Where inter-row cultivation is used, leek rows are spaced typically at 40 cm apart. At wider row spacing, a potato ridger may be used to earth-up the crop and aid weed control.

Thermal weed control may be used with care pre- or post- crop emergence or pre- and post-planting to kill seedling weeds. It is safer to use shields or direct the burners away from the crop row. Leeks like onions have some tolerance to flame weeding due to their basal growing point but tolerance will depend on growth stage and condition of the crop. Grass weeds have the same basal growth habit and are tolerant of flame weeding. Perennial weeds are also unlikely to suffer any long-term damage from flaming. The tolerance of most weeds increases with growth stage.

Garlic

Garlic is resistant to flame weeding and regenerates with little obvious damage even after flaming at the relatively low speed of 0.6 km/h.

Publications consulted, links and further reading

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