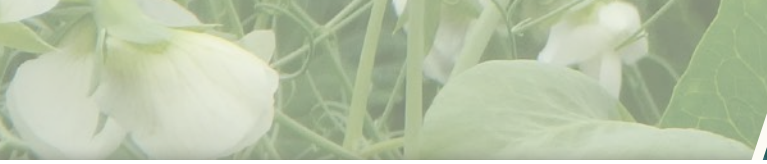

ORGANIC FIELD PEAS

Weed Control

Field peas are an excellent rotational crop for an organic system. Effective weed control is critical to maximize yield and grain quality of an organic pea crop. Peas are naturally poor competitors with weeds and yield loss can be as high as 80% in the absence of effective weed control.[1] For organic field peas, three strategies will help maximize weed control:

1. Establish a competitive plant stand.
2. Ensure timely and effective mechanical weed control.
3. Intercrop peas to increase competition with weeds.

1. ESTABLISH A COMPETITIVE STAND

Field Selection

Crop rotation influences the competitive ability of a pea crop. Field peas should follow dissimilar crops, like cereals or oilseeds, as they generally yield best when grown after competitive crops such as winter/spring wheat or barley.[2] Select fields where good control of aggressive perennial weeds, like Canada thistle and quack grass, has been achieved.

Nutrient management will help improve the competitive ability of peas. Ensure phosphorus and potassium are adequately supplied prior to growing peas. Inoculate with *Rhizobium leguminosarum* bacteria, even on fields with a history of peas, to facilitate biological nitrogen fixation.

Seeding Date and Soil Temperature

One challenge facing organic systems is to balance seeding timing with spring weed control. It is optimal to seed peas from late April to mid-May, as they are tolerant of cool soil temperatures and spring frosts. This seeding window promotes early emergence, which improves crop competition against weeds. Later seeding may be necessary if pre-plant tillage for weed control is required, as you should seed into a clean field. However, planting in late May or early June can reduce yield by >20%.[3]

Seed Quality

Using #1 certified seed ensures high germination, purity and low cracked seed coats. This will support rapidly emerging seedlings that are healthy, vigorous and competitive with weeds. If using saved seed, send it to a lab to test for germination.

Target Plant Stand and Seeding Rate

Semi-leafless peas do not readily tiller or branch like crops such as cereals. This magnifies the importance of establishing a plant stand that can compete with weeds. Target 120 live plants/m².[4] Adjust the seeding rate to account for expected seedling survival, germination and thousand seed weight (TSW), which varies by variety and seed lot. Adjust survival based on expected plant stand loss from in-crop mechanical weed control. Expected loss from mechanical weed control is in addition to the normal survival loss. Plant stand loss will vary by implement, its settings and crop staging. In-crop tine harrow and rotary hoe applications will cause greater plant stand losses as they are non-selective, affecting both the crop and weeds. Versus an inter-row cultivator that is selective and cultivates weeds between crop rows, causing less crop damage.[5]

SEEDING RATE (lbs/acre)

$$\frac{\text{TSW (g/1,000 seeds)} \times \text{Target Plant Population/m}^2}{\text{(Seed Germination \% (e.g., 0.95)} \times \text{Expected Survival \% (e.g., 0.85)} \times 100)} \times 0.89$$

Note: Under ideal conditions (soil >5°C average, ideal moisture), an estimated 85% of seeds will result in a plant. If soil temperatures are averaging <5°C for the first 21 days the peas are in the ground and/or soil moisture is excessively wet or excessively dry, seed survivability can drop to 60% or lower, even with >90% lab tested seed germination.

Seeding Depth

Rapid and uniform emergence will help pea seedlings compete with emerging weeds. Prepare a firm seedbed and ensure good seed-to-soil contact when planting. Seed 1.5–2 inches deep, but under dry conditions, peas can be sown deeper to reach soil moisture. Ensure the seed is placed half an inch into moisture.

2. TIMELY AND EFFECTIVE MECHANICAL WEED CONTROL

The critical weed-free period in peas, which is the duration of time a crop must be kept weed-free to minimize yield loss, is the first two weeks after emergence. Pea yield can be reduced by up to 25% if weed control is delayed until four weeks after emergence.[6]

There are several options for the timing and method of mechanical weed control and field peas are surprisingly tolerant to in-crop methods. Multiple passes are often necessary to obtain acceptable weed control.[1] The optimal timing and method will depend on environmental conditions, weed and crop staging and access to equipment.

The optimal weed staging for the rotary hoe and flex tine harrow is the white thread stage. To identify this stage of weeds, move the top surface of the soil around by hand—the weeds will be white and tender and not yet exposed to sunlight. This is the staging just before emergence when weeds can easily be injured by mechanical weed control.[5] Generally, the smaller the weed, the easier it is to control, and the larger it is, the more challenging it is to uproot or bury. Ideal conditions are dry soil surfaces and hot, sunny conditions when the pea plants are more flexible and uprooted weeds can dry out easily. Stop and inspect often to ensure weeds are controlled and crop damage is minimized.

Pre-Plant

A variety of tillage tools can be used once or multiple times before planting to control early emerging weeds. Depending on soil moisture conditions, tillage can dry soils to seed depth, leading to delayed and uneven emergence. A good rule of thumb for tillage depth is as deep as necessary and as shallow as possible.[7] Tool selection should be governed by the size and type of weeds being controlled. For instance, annual weeds can be controlled with flex tine harrows or a rotary hoe operating at shallower depths. Larger weeds will likely require a cultivator set to deeper depths. Seeding should follow as soon as possible after the final pre-plant tillage pass to increase the likelihood that the crop will emerge ahead of newly germinating weeds.

continued

Pre-Emergent

After seeding but before crop emergence, a rotary hoe or flex tine harrow can effectively control small-seeded annual weeds. To maximize performance, ensure weeds are at the white thread stage (Figure 1). The rotary hoe is most effective in fields with heavy crop residues. With either tool, adjust the working depth so that germinating peas are not damaged.

Early Post-Emergent

The rotary hoe has a narrow post-emergence window. Effective weed control is achieved until the first leaf stage in grassy weeds and the cotyledon stage in broadleaf weeds. A rotary hoe can be used up to the emergence (VE) stage in peas and controls weeds within and between crop rows.[5]

Flex tine harrows can be used up to the 5th true node stage in peas and can control weeds up to the cotyledon stage within and between crop rows.[5] Tine harrows can be adjusted by their angle, speed and depth. Adjusting the tine harrows at 45° has shown reduced crop injury and improved weed control. Settings should account for crop and weed staging, weed populations and impact on plant stand.[5]

Figure 1. A post-emergent rotary hoe pass in peas with weeds uprooted at the cotyledon and white thread stages.

Late Post-Emergent

Post-emergent mechanical weed control should occur during the heat of the day when pea plants are most pliable and least likely to be damaged.

Inter-row cultivation can be used from the 5th–10th true node stages in peas prior to row closure, and requires mechanical or electronically guided equipment to prevent crop damage.[1] It is more effective at controlling larger weeds than a tine harrow or rotary hoe between crop rows but provides little control of weeds located within the row.

Late post-emergent inter-row cultivation in peas (left) versus no cultivation (right).

3. INTERCROPPING

Intercropping, the practice of growing two or more cash crops together, increases pea competition against weeds by providing additional ground cover. Peas seeded with cereal crops like oats or barley can support earlier seeding by competing with wild oats. Seeding peas with mustard is more suitable for suppressing warm-season weeds in fields with low wild oat pressure.

Keep a Weed Control Journal

Mechanical weed control in field peas is as much an art as it is a science. The success of a weed control operation is determined by factors including (but not limited to) weed species present, crop and weed growth stages, machinery settings, tractor ground speed, the weather and soil conditions during operation. These factors can change during an operation, requiring adjustments to ensure performance. Keep a detailed weed control journal to document your experiences, including plant stand reductions from each mechanical weed control operation to fine-tune your seeding rate. This will be an important reference to help you build the knowledge and skills needed for consistent weed control success each year.

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November 2022