

Inter-row cultivation in soybean

Mechanical control of weeds in soybean crops

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Young soybean crops are vulnerable to weed competition, especially if spring weather is cool. Inter-row cultivation is one of the practices used to tip the balance in the competition between the crop and weed flora in favour of the soybean.

Outcome

Inter-row cultivation suppresses weeds between rows and loosens the soil surface. This improves soil aeration, reduces water evaporation, and breaks soil crusts. This has a positive effect on the microorganisms, as well as on the number and activity of nitrogen-fixing bacteria that are found on soybean roots leading to increased biological nitrogen fixation. The overall result is an increase in crop yield and quality.

Applicability

Theme: Crop management

For: All soybean growers

Where: Where soybean is planted

Timing: April/May

Equipment: Cultivator

Follow-up: No follow-up action required

Impact: Reduction of weeds, soil aeration is improved, soil crust is broken



Inter-row cultivator



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Attention to detail is essential

There are various options for mechanical inter-row weed control. Soil conditions, growth stage of weeds, and the equipment used will determine which practices are well-suited to the soil conditions, selected crop, and site-specific conditions.

A row cultivator tills the soil and uproots weeds between rows. The machine used matches the configuration of the seeding machine. Cultivation is carried out in the same direction and row number as the planting. Optimal speed is about 6 km/h. The speed of the tractor, the depth, and the size of the protective zone between the tines or hoes and the crop vary with the selected crop. There is now a range of cultivating tools such as different harrows, rotary hoes, finger weeders and flame weeders that can be used in combination mounted on row cultivators for mechanical weed control.



Inter-row cultivator

When to cultivate

Soybean can be inter-row cultivated up to three times during the early growing period (generally in April and May). Cultivation is most effective when the weeds are young. One cultivation at this stage has the largest effect. The earliest opportunity to cultivate is at the first trifoliolate leaf stage of the crop. At this time, the individual hoes can go closer to the plants and slightly deeper (5-6 cm), taking care not to cover the young plants with soil. With second or later cultivations, the protective plant zone must be wider, and cultivation should be shallow (3-4 cm), so that the crop root system is not

damaged. The latest opportunity to cultivate is just before canopy closure. This is a relatively easy operation. The hoes must be sharp, properly adjusted to cultivate at the same depth and provide the required protection zone of 7.5 to 10 cm from the plants.

Impact on yield

One or two inter-row cultivations increase soybean yield by up to 275 kg per ha. This is also confirmed in trials where herbicides were also used established in 2015. One inter-row cultivation increased yield by 5.3%, two by 7.1% and three by 7.3%. The increase was larger in years with lower rainfall.



Second cultivation, cultivator in action



Machinery in action

Row width is an important consideration

Row spacing that is too wide or too narrow can affect yield through increased adverse competition for nutrients, water, light, etc. Using relatively narrow rows can delay the start of the critical period by increasing the competitiveness

of the crop in relation to the weeds. Many trials have examined the effect of spacing between row and between plants within the row. The results show that the best row spacing is 45 or 50 cm, both in terms of available machinery and from the point of view of inter-row cultivation and weed control. In comparison to 70 cm, row spacing of 50 cm helps to stabilize weed flora in soybean production.



Weed presence before inter-row cultivation



Inter-row spacing after inter-row cultivation

Effect on biological activity

Heavy soils are vulnerable to anaerobic conditions. Inter-row cultivation has a positive effect on the microorganisms as well as on the number and activity of nitrogen-fixing bacteria that are found on soybean roots. According to cultivation aerates the soil, which is important for nitrogen fixation as well as for the activity of other soil microorganisms that decompose organic matter. Inter-row cultivation reduces evaporation and preserves soil moisture, which increases microorganism activity and the fixation of atmospheric nitrogen. This ultimately increases soybean yield.

Key practice points

Timing

- April/May

Frequency

- Two or three times during soybean growing period

Benefits

- Reduction of weeds in the inter-row space
- Evaporation is reduced, soil moisture is conserved
- Soil crusts are broken and soil aeration promoted
- Activity of microorganisms is increased
- Plant growth and vigour increased



A fully functioning soybean crop canopy following successful weed control. Photograph: Donal Murphy-Bokern

Sources

Information presented in this practice note results from research carried out by Institute of Field and Vegetable Crops Novi Sad, Serbia.

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Further information

The Legume Hub channel on Youtube provides helpful video resources. Demonstration of machinery for mechanical weeding:

<https://www.youtube.com/watch?v=FJZ8VEKizhc&t=14s>

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