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Significance of Weed Management Methods for Higher Crop Production

V. P. Parmar*, S. B. Diwan and M. M. Saiyad

Assistant Professor, College of Agriculture, Faculty of Agriculture, Parul University, Vadodara

Corresponding author*: vikramparmar410@gmail.com

ABSTRACT

Farmers have struggled with the presence of weeds in their fields since the beginning of agriculture. Weeds can be considered a significant problem because they tend to decrease crop yields by increasing competition for water, sunlight and nutrients while serving as host plants for pests and diseases. Since the invention of herbicides, farmers have used these chemicals to eradicate weeds from their fields. Using herbicides not only increased crop yields but also reduced the labor required to remove weeds. Today, some farmers have a renewed interest in organic methods of managing weeds since the widespread use of agro-chemicals has resulted in purported environment and health problems. It has also been found that in some cases herbicides use can cause some weed species to dominate fields because the weeds develop resistance to herbicides. In addition, some herbicides are capable of destroying weeds that are harmless to crops, resulting in a potential decrease in biodiversity on farmers. It is important to understand that under an organic system of seed control, weeds will never be eliminated but only managed.

Critical period of weed control

This period has been defined as an interval in the life cycle of the crop when a must be kept weed – free to prevent yield loss. If weeds have been controlled throughout the critical period, the weeds that emerge later will not affect yield and can be controlled prior to harvest with a harvest and to burn down the weeds and desiccate the crop. Horticulture crops are very sensitive to weed competition, and need to kept weed-free, from planting, emergence or bud break, until the end of their critical weed –free period. If the crop is kept weed-free for the critical period, generally no yield reduction would result. Again, weeds emerging after the critical weed-free period will not affect yield, but control efforts after this time may make harvest more efficient, or reduce weed problems in subsequent years in perennial crops.

Cultural Method

A. Crop rotation:

Crop rotation involves alternating different crops in a systematic sequence on the same land. It is an important strategy for developing a sound long term weed control program. Weeds tend to thrive with crops of similar growth requirements as their own and cultural practices designed to contribute to the crop may also benefit the growth and development of weeds. Monoculture, that is growing the same crop in the same field year after year, results in a build-up of weed species that are adapted to the growing conditions of the crop. When diverse crops are

used in a rotation, weed germination and growth cycles are disrupted by variations in cultural practices associated with each crop (tillage, planting dates, crop competition, etc).

B. Cover crops:-

Rapid development and dense ground covering by the crop will suppress weeds. The inclusion of cover crops such as rye, red, clover, buckwheat and oilseed radish or over wintering crops like winter wheat or forages in the cropping system can suppress weed growth. Highly competitive crops may be grown as short duration 'smother' crops within the rotation.

C. Intercropping:-

Intercropping involves growing a smother crop between rows of the main crop. Intercrops are able to suppress weeds. However, the use of intercropping as a strategy for seed control should be approached carefully. The intercrops can greatly reduce the yields of the main crop if competition for water or nutrients occurs.

D. Field Scouting:-

It involves the systematic collection of weed and crop data from the field (weed distribution, growth stage, population, crop stage etc). The information is used, in the short term, to make immediate weed management decisions to reduce or avoid economic crop loss. In the long term, field scouting is important in evaluating the success or failure of weed management programs and for making sound decisions in the future.

E. Mulching:-

Mulching or covering the soil surface can prevent weed seed germination by blocking light transmission preventing seed germination. Allelopathic chemicals in the mulch also can physically suppress seedling emergence.

F. Planting patterns:-

Crop population, spatial arrangement, and the choice of cultivar (variety) can affect weed growth. Fr example, studies have shown that narrow row widths and a higher seeding density will reduce the biomass of later-emerging weeds by reducing the amount of light available for weeds located below the crop canopy. Similarly, fast growing cultivars can have a competitive edge over the weeds.

G. Variety selection:-

Careful selection of crop varieties is essential to limit weeds and pathogen problems and to satisfy market needs. Any crop variety that is able to quickly shade the soil between the rows and is able to grow more rapidly than the weeds will have an advantage.

H. Sanitation:-

It is possible to prevent many new weeds from being introduced onto the farm and to prevent existing weeds from producing large quantities of seed. The use of clean seed, mowing weeds around the edges of fields or after harvest to prevent weeds from going to seed, and thoroughly composting manure before application can greatly reduce the introduction of weed seeds and difficult weed species.

MECHANICAL METHOD:-

Mechanical removal of weeds is both time consuming and labor-intensive but is the most effective method for managing weeds. The choice of implementation, timing, and frequency will depend on the structure and form of the crop and the type and number of weeds. Cultivation

involves killing emerging weeds or burying freshly shed weed seeds below the depth from which they germinate. It is important to remember that any ecological approach to weed management begins and ends in the soil seed bank. The sol seedbank is the reserve of weed seeds present in the soil. Observing the composition of the seedbank can help a farmer make practical weed management decisions. Burial to 1 cm depth and cutting at the soil surface are the most effective ways to control weed seedlings mechanically. Mechanical weeders include cultivating tools such as hoes, harrows, tines and brush weeders, cutting tools like mowers and stimmers, and dual-purpose implements like thistle-bars. The choice of implement and the timing and frequency of its use depends on the morphology of the crop and the weeds. Implements such as fixed harrows are more suitable for arable crops, whereas inter-row brush weeders are considered to be more effective for horticultural use. The brush weeder is mainly used for vegetables such as carrots, beetroot, onions, garlic, cerely and leeks. The optimum timing for mechanical weed control is influenced by the competitive ability of the crop and the growth stage of the weeds.

Thermal Method

Flamers are useful for weed control. Thermal weed control involves the use of flaming equipment to crate direct contact between the flame and the plant. This technique works by rupturing plant cells when the sap rapidly expands in the cells. Sometimes thermal control involves the outright burning down of the weeds. Flaming can be used either before crop emergence to give he crop a competitive advantage or after the crop has emerged. However, flaming at this point in the crop production cycle may damage the crop. Although the initial equipment cost may be high, flaming for weed control may prove cheaper than hand weeding.

Propane – fuelled models of flamers are the most commonly used. Flaming dose not burn weeds to ashes; rather the flame rapidly raises the temperature of the weeds to more then 130 °F. The sudden increase in temperature causes the plants cell sap to expand, rupturing the cells walls. For greatest flaming efficiency, weeds must have fewer than two true leaves. Grasses are difficult to impossible to kill by flaming because the growing point is protected underground. After flaming, weeds that have been killed rapidly change from a glossy appearance to a duller appearance. Flame weeders can be used when the soil is too moist for mechanical weeding and there is no soil disturbance to stimulate further weed emergence.

BIOLOGICAL METHOD:-

Biological control would appear to be the natural solution for weed control in organic agriculture.

a. Allelopathy

Allelopathy is the direct or indirect chemical effect of one plant on the germination, growth or development of neighbouring plants. I is now commonly regarded as component of biological control. Species of both crops and weeds exhibit this ability. Allelopathic crops include barley, rye, annual ryegrass, buckwheat, oats, sorghum, sudan sorghum hybrids, alfalfa, wheat, red clover, and sunflower. Vegetables, such as horseradish, carrot and radish, release particularly powerful allelopathic chemicals from their roots. Suggestions have been made that allelochemicals and other natural products or their derivatives could form the basis of

bioherbicides. However, it is unclear whether the application of natural weed killing chemicals would be acceptable to the organic standard authorities.

The allopathic effect can be used to an advantage when oats are sown with a new planting of alfalfa. Allelopathy from both the alfalfa and the oats will prevent the planting from being choked with weeds in the first year. Buckwheat is also well known for its particularly strong weed suppressive ability. Planting buckwheat on weed problem, fields can be an effective cleanup technique. Some farmers allow the buckwheat to grow for only about six week before plowing under. This not only suppress and physically destroys, weeds; it also release phosphorus and conditions the soil.

b. Beneficial organisms

Little research has been conducted on using predatory r parasitic microorgniams or insects to manage weed populations. However, this may prove to be a useful management tool in the future. Natural enemies that have so far been successful include a weevil for the aquatic weed salvinia, a rust for skeleton weed and probably the most famous, a caterpillar (Cactoblastis sp.) to control prickly pear. There is also considerable research effort aimed at genetically engineering fungi (myco-herbicides) and bacteria so that they are more effective at controlling specific weeds. Myco-herbicides are a preparation containing pathogenic spores applied as a spray with standard herbicide application equipment.

Weeds are subject to disease and insect attacks just as crop are. Most biological control of weeds occurs in range or non crop areas. As a result, biological control has little relevance for vegetable growers. Geese have been used for weed control in trees, vine, and certain row crops. Most types of geese will graze weeds, but Chinese weeder geese are considered the best for row crops. Chinestweeder geese are smaller than other types and tend to walk around delicate crop plants rather than over them. Geese prefer grass species and rarely eat crops. If confined, geese will even dig up and eat Johnson grass and Bermuda grass rhizomes. Care must be taken to avoid placing geese near any grass crops such as corn, sorghum, or small grains, as this is their preferred food. Fruiting vegetables, such as tomatoes when they begin to color, might also be vulnerable, so geese would have to be removed from tomato fields at certain times. Geese require drinking water, shade during hot weather, and protection from dogs and other.

CONCLUSION

Weeding at perfect stage will give maximum benefit to crops and farmers. After the Weeding at the critical period weeds emerge later will not affect yield and can be controlled prior to harvest with a harvest and to burn down the weeds and desiccate the crop. Weeds emerging after the critical weed-free period will not affect yield. Cultural methods like Crop rotation, Cover crops, Intercropping, Field Scouting, Mulching, Planting patterns, Variety selection and Sanitation are very effective and important strategy for developing a sound long term weed control program without treating soil by any chemical. Mechanical removal of weeds and thermal are useful for weed control. Biological control methods like Allelopathy and Beneficial organisms are emerging trends in agriculture. Biological control would appear to be the natural solution for weed control in organic agriculture. Combination of different cultural practices for the weeding at critical weeding stage give maximum impact on crop production.