Article ID: AEN-2021-02-09-008

Weed Management in Cropping Systems

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Weed management practices should be planned for the cropping system as a whole rather than for individual crops. Weed shift need to be monitored continuously in all cropping systems and agro-ecological regions in order to assess emerging weed problems and plan weed management strategies. Weed researchers associated with cropping systems work in recent years have recognised the importance of integrated weed management approaches, which take cognisance of ecological and biological aspects of crops and weeds rather than looking mainly at specific weed control methods.

Weed management in intercropping

Weed population is less in intercropping system compared to sole crop. In intercropping the total canopy at any time is higher than in sole cropping and the ground cover is obtained quickly due to the simultaneous growing of two or more crops. The enhanced competitive ability of intercropping is primarily due to high plant population pressure provided by the component species together. The physical manipulations of the intercrop environment for weed control very closely resemble those used for sole crops. Complete crop cover and high plant density available in intercropping system reduces weed growth. Intercropping has potential as a means of weed control because it offers the possibility of a mixture of crops which capture a greater share of available resources than in monocropping.

Hand weeding: It is the most effective method of weed control compared with other methods. The application of fluchloralin and nitrofen controlled most of the weeds and reduced nutrient removal in sorghum-legume intercropping system compared with the control but was less effective than hand weeding.

Mechanical weeding: Mechanical weeding may not be possible in random sowing or in closely planted rows of intercropping systems.

Crop competitiveness: The practices such as narrow row spacing, increased plant density, appropriate time of planting, and fertility management are capable of shifting the competitive balance to favor crops over weeds. When two cultivars of mungbean were intercropped with maize, the more prostrate cultivar was more weed suppressive.

Inclusion of cover crops/ smother crops: Cover crops have a smothering effect on other crops present in intercropping system. Maize + soybean (1:1) intercrpping system suppressed the weed species by canopy cover which resulted in highest weed smothering efficiency as compared to maize + green gram.

Allelopathy: Crops with allelopathic potential when intercropped with other crop plants help to reduce weed intensity. Intercropping berseem with legumes (broad bean and pea) reduced the intensity of *Orobanche crenata* due to allelopathic activity of berseem. The intercropping of two allelopathic crops (sorghum and sunflower) suppressed weeds in cotton by 60 - 62%.

Brown manuring : It is an ecologically safe and economically viable agriculture technology. In brown manuring herbicides are used to kill the green manure crop and the killed manure is allowed to remain in the field along with main crop. Cowpea in rice fields can be incorporated by spraying

2,4-D at 1 kg ha $^{-1}$ at 30 - 40 DAS and in wet seeded rice, daincha can be raised as intercrop by sowing 20 kg seeds of daincha per ha along with rice .It can be incorporated by spraying 2,4-D at 1 kg ha $^{-1}$ at 30 DAS. Weed density is found to less in both the cropping systems.

Application of herbicides: Intercropping may reduce reliance on chemical weed control in addition to being an environmentally safer way of managing weeds. It is difficult to find chemicals that will control a broad spectrum of weeds without causing damage to the component crop. So herbicide selection is important in the case of intercropping system.

Integrated weed management: Integrating all the above component in an intercropping system will help to reduce the weed population in some extent. The application of pendimethalin @ 0.75 kg ha $^{-1}$ as pre emergence followed by one rotary hoeing in maize + cowpea, maize + blackgram intercropping system resulted significantly lesser weed population than in sole maize.

Weed management in sequential cropping

For effective weed management for sequential cropping system study of weed ecology is important as each cropping system provides many ecological niches for weed growth. Giant foxtail (*Setaria faberi* Herrm.*)* density was greatest in continuous corn (*Zea mays* L.*)*, intermediate in a corn/soybean rotation, and lowest in a corn/soybean/winter wheat rotation.

Hand weeding, mechanical weeding and shortening the turn over time (fallow period) between two crops are some of the effective methods of weed control in sequential cropping

Stale seed bed: In stale seed bed technique after land preparation, withhold sowing and allow the weeds in the top layers of the soil to germinate. After two weeks, when most of the weed seeds would have germinated, destroy the germinated seedlings by ploughing the field or by using non selective herbicides like glyphosate and glufosinate ammonium. if time permits repeat the process once again. The stale seed bed technique is mostly used in wetland rice based cropping system in order to kill the weedy rice.

Tillage: Weed control is an important objective of tillage. It may destroy weed seedlings by uprooting, smothering, desiccating, decomposing or merely weakening weed plants through dislodging, damaging, disorienting, depleting food reserves, root pruning or other injury. Continuous ZT resulted in significantly higher yield of rice (2.94 t ha $^{-1}$), wheat (4.45 t ha $^{-1}$) and rice–wheat system (7.39 t ha $^{-1}$) compared to continuous CT (2.35, 3.86 and 6.21 t ha $^{-1}$, respectively). In the case of sequential cropping fallow period in between two crops leads to an intense weed problem in the following crops. So shorten the fallow period by minimum or zero tillage is essential.

Mulching: Mulching had a significant influence on reducing weed growth in sequential cropping. The cumulative effect of mulching using residues from the previous crop maintained soil fertility and reduced weed growth in a maize-soybean-cowpea sequential cropping system.

Use of herbicides: Selective herbicides are available for sole crops and effective weed control can be achieved by using such herbicides. But the residual effect of these herbicides has to be carefully evaluated before using them in sequential cropping. It will injure sensitive crops in sequential cropping by absorbed by succeeding crops and residues accumulated in the produce. It also inhibits growth of soil micro organisms. The Knowledge of the persistence and residual effect of herbicides in the soil is essential to use them safely and effectively in a cropping system. So inorder to avoid these problems the rotation of herbicides with different modes of action is possible.

New technologies in weed management includes use of bioherbicide, robotic weeders etc. integrated weed management is more effective than each single methods of weed control

Weed management in relay cropping

In relay cropping, the relay crop should be planted about 2-3 weeks before the harvest of the previous crop, after removing the weeds manually. In case of maize/cassava relay cropping, the earthing up for cassava after maize harvest eliminates the needs for further weed control. Care should be taken for selecting the herbicide which does not cause any residual toxicity to the second crop. Relay intercropping of forage legumes in organic winter wheat appeared to be efficient at tackling the weed issue. The presence of relay crop prior to harvesting of previous crop may limit the weed growth. Higher competition for resources, especially light, was the reason for less weed emergence and higher mortality in relay cropping systems.

Conclusion

An integrated approach which includes cultural, mechanical and chemical methods to weed management is essential to prevent or retard the development of resistant weed populations in cropping systems.

References

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