



Review Article

MANAGEMENT (SUPPRESSION) OF WEEDS IN MODERN CROP PRODUCTION THROUGH THE NEW AGRONOMIC APPROACHES INSTEAD OF CHEMICAL WEED MANAGERMENTS: A REVIEW

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Abstract- The production of crops under weed free condition is more important to get the optimum yield by efficiently utilising the all-natural resources as well as conserving them without causing harm to natural system. In modern crop production system use of chemicals increasing day by day which leads to destruction in soil properties as well as increasing the herbicide resistance development mechanism in weeds. The overall effects of chemical weed management increased in modern crop production system then in traditional system of crop production. The reduction in weed flora by using the modern agronomic approaches are more effective in both cost effective and reducing the impact of harmful agro-chemicals was used and using in the present time too in the crop production. The impact of agronomic practices not only reduced the harmful weed flora from the crop production area but also increase in the yield of crops. Because in agronomic approach of weed suppression, they are using weed for preparing the various types of organic manures to supply the nutrient for the crop production and also restore the soil fertility. Agronomic approaches include proper plant density (PPD), proper planting time (PPT), minimum tillage practices (MTP) and stale seedbed technique's (SST's).

Keywords- Agronomic, Crops, Weed, Chemicals, Effective, PPD, PPT, Approaches.

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Introduction

The crop production and management of weeds both are most important aspects of the modern crop production system. Weed is the most powerful and damaging plant species in the agricultural system, which leads to reduction in the crop production due to competition for major natural resources like water, nutrient, space and for light with the crop plant. The ability of weeds to use the natural resources at a faster rate and cause the soil illness, that is finally leads to reduced crop production. But adoption of modern crop management technique are the alternative of chemical weed management. The use of stale seedbed technique is the most effective tools for managing the weed which are already present in the field as well as reducing the seed bank from the soil. When fundamental principles of good crop production husbandry are ignored from the view point of weed suppression and we are directly become dependent upon the physical or chemical methods of weed control. In highly weed situation, crop plants become weak due to less nutrient availability in the soil for proper growth and development. The modern agronomic practices mainly used by developed and developing countries but mostly by developing countries because their limited input availability while in the developed one they relied upon chemical weed management practices. The most commonly used modern agronomic practices are having so many specific features like resource efficient, cost effective, increase in plant yield and eco-friendly. These are leads to uniform and vigorous growth, good plant stand with high dry matter production per plant. Manual weeding and using different plant geometry also helps in controlling the weeds in irrigated wheat crop (Jadhao *et al.*, 1993).[1] The modern crop production possible under highly weedy situation if, we adopt the new agronomic or crop husbandry practices as well as chemical weed management upto a limited extent. The best management practices includes the

following agronomic or crop husbandry practices.

Optimum plant population and vigour of seedlings:

The optimum plant population leads to proper cover of the land and it will do not leave the free space for the weed flora. If there is no free space than, weeds are automatically suppressed by crop plants due to vigorous and fast early growth of crop plants while, less and weak growth of the weeds due to less availability of nutrient, space and light available. Optimum plant population can be decided by sowing the healthy seeds *i.e.*, healthy seedling transplanting specially in rice crop because weeds are the serious problem in upland rice as well as in lowland rice. It includes use of high viability seed, soil and seed treatment, optimum seed rate, proper seeding time and method. The row spacing of crops should be as narrow as agronomic recommendations will allow so crops will come close very soon [2].

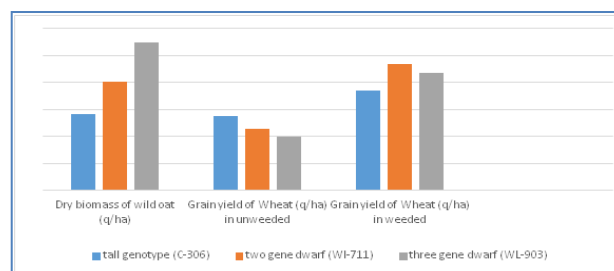


Fig-1 Effect of three Wheat genotypes on the dry matter production of associated wild oat (*Avena fatua*) and grain yield of Wheat.

Source: Angiras and Sharma, 1993.

Selection of crops and their simulation

It is well known that under the uncontrolled condition, weed damage the crop plants more than the crop on weeds. This imbalance of nature can be simulated by man in favour to crop plants by modifying the cropping conditions, leading to simulation of crop growth of a particular crop in a controlled soil environment. Vigorous crop plants having higher competition ability to compete with the weed flora in specific situation. Selective crop simulation can be achieved by many ways. Application of suitable nutrient sources *i.e.*, application of inorganic fertilizers (nitrogen on pearl millet)

Table-1 effect of split application of nitrogen in pearl millet on the growth of weeds at hissar (Rathee et al., 1992) [3]

Time of application of nitrogen (total 120kg/ha)	Dry weed biomass (45 DAS, g/ha)
1.full dose at 3 w.a.s.	9.25
2.1/2 at sowing +1/2 at 3 w.a.s.	11.50
3.1/4 at sowing +3/4 at 3 w.a.s.	10.71

Source: Rathee et al., 1992

Proper Planting technique (PPT)

Many planting methods leads to made the soil surface rough and dry will discourage the weeds which are growing early in the season. The planting technique of wheat crop in the squares by using a pre sowing irrigation. For example seedbed of winter cereals *i.e.*, wheat seedbed it leaves 3-5 cm soil above the surface which makes surface rough and reduce the growth of weeds. The sprouting seeds of the weeds are not destroyed by ploughing, therefore, to provide the equal time for germination to both crop and weeds, farmers should accomplished seedbed preparation before onset of monsoon.

Table-2 Effect of narrow row spacing in wheat on the yield of weeds at palampur

Treatments(row spacing)	Dry weed biomass (g/ha)		
	Lolium sp.	Phalaris sp.	All weeds
15 cm	7.79	5.67	NA
20 cm	8.84	6.94	NA
C.D.(p=0.05)	0.29	0.55	-

Source: Angiras and Sharma (1993) [2]

Crop-cycling technique (CCT):

Crop cycling means growing of the crops in such a manner that the same crop will not grow in the next season *i.e.*, crop should be rotate every year. Crop cycling or rotation of the crops leading in control of crop associated as well as crop bound weeds. For example- Avena Fatua and Cuscuta spp. using the various crops in rotation leads to suppress the so many weeds and reduce their harmful impact on the crop as well as some crops exude chemicals in the rhizosphere and stimulate weed seed germination those are easily controlled through chemical weed control. If we grow the same crop, it will increase the weeds population [4].

Stale seedbed technique (SST)

In this technique 1-2 flushes of weeds are destroyed before sowing the main crop in the field. In SST technique adequate moisture is supplied which helps in early germination of weed seeds and those are simply managed by cutting or using any other methods of weed control. The suppression of weeds through this technique dependent upon the how much time is available, one or two times the weeds are suppressed before planting of crops in stale seedbeds [5]. The main advantage of adopting this technique are crop germinate in the weed free environment, crop grow at a faster rate, increased in yield of crops per unit time ad space and easy to adopt. But this technique have both benefit and limitations also. According to one study it is shown that the preparation of the stale seedbed one month before sowing of rice with paraquat is useful in suppressing the weeds in specific situation [6].

Smoother Crop technique (SCT)

As we know that the smoother crop having the fast growing nature which leads to quick germination and develop large canopy. Because of development of huge

canopy helps in suppressing the weeds by shading on the weed plants, those are growing slowly. It reduced the rate of photosynthesis in weed plant because, smoother crop's canopy acts as a barrier to reach the solar radiation and it finally leads to death of weed plants. Due to fast growing nature, these crops most popular in suppressing the weeds and those are recommended in weedy situation regions or the cropping system in which weed is the major constraints in crop production especially in dryland area. It is recommended in dry regions because of less moisture availability during growing season or you can say water is the limiting factor. In a study it was shown that repeatedly practicing of that technique as an intercrop to suppress the weed in the main crop. But it will not completely suppress and one additional weeding was required along the main practice [7]. In another study, was shown that growing of cowpea in coconut-banana plantation suppress the weeds upto three months Savithri et al., 1994 [8]; Chatterjee and Maiti (1994) [9]; and Hosmani (1991) [10].

An important role of smother crop in agriculture is to suppress perennial weeds in crop field by reducing their growth and development through the reduction in their ability to absorb the nutrients from the soil and food production by photosynthesis. For example, cowpea, berseem, lucerne, and clover crops etc. The success of any smother crop in suppressing weeds can be identified at the time of the harvesting

Off-season tillage technique (OST)

Off-season practices include the ploughing of soil in time when the crops are absent in the field *i.e.*, summer time, so it also known as summer deep ploughing and summer fallowing. In former ploughing is done in hot months and in later one soil is kept open to expose in sun. In summer fallowing perennial weeds can be easily controlled due to high temperature around 45- 50 °C. It controls weed from deeper layer of soil through destruction of weed rhizomes which comes upon soil surface through deep ploughing.

Minimum Tillage Technique (MTT)

Minimum tillage is practiced to reduce the impact of weed upon the crop growth through the suppression of weeds. Deep and frequent tillage bring weed seeds on the soil surface from the deeper layers and it will helps in reducing the number of seeds from the cropped lands. For example rice-wheat cropping system in Northern and Western India zero-tillage is getting popularity.

Creating water logged situation

Flooding is the most commonly used method of suppressing the weeds. Flooding followed in area where sufficient water is available whole the growing period of crops and those crops requiring high water also. For instance, in some part of MP state deep flooding of fallow fields with rain water is practiced.

Conclusion

The main purpose of adopting the agronomic or crop husbandry practices is to reduce the harmful impact on soil and environment due to application of agro-chemicals in modern crop production. Another reason is to keep farmers more profitable by reducing the cost of cultivation, which may be increased due more use of chemicals to suppress weed dominant in our cropping system. It is the most practical way to control or suppress the weeds in minimum cost, these are (i) Manipulation of soil conditions. (ii) Optimum placement of nutrient fertilizers. (iii) Maintaining good crop stand *i.e.*, optimum plant density. (iv) Stale seedbed sowing and (v) Land levelling etc.

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Authors contributions

Ganesh Narayan Gurjar is the main author for his review paper work. Narendr Kumar Meena and Rajesh Kumar are coauthors.

Abbreviations

^oC = Degree Celsius
CM = Centimetres
CCT = Crop Cycling Technique
MP = Madhya Pradesh
MTP = Minimum Tillage Practices
PPD = Proper Planting Density
PPT = Proper Planting Time
SCP = Smother Crop Technique
SSTs = Stale Seedbed Techniques
OST = Off Season Tillage Technique

Ethical approval

This article does not contain any studies with human participants or animals performed by any of the authors.

Conflict of Interest: None declared

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