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Weed Management Practices for Timely Reduction of Weed Growth in Various Crops

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INTRODUCTION

Weeds are the plants, which grow where they are not wanted and they compete with crops for water, soil nutrients, light and space (ie CO2) and thus reduce crop yields. Weeds interfere with crops at any time they are present in the crop. Thus weeds that germinate along with crops and they are more competitive and adaptable to all the adverse environments. It has been estimated that in general weeds cause 5% loss to Agricultural production in most developed countries. 10% loss in less developed countries and 25% loss in least developed countries.

Effects of weeds in agriculture

- Weeds compete with the crop plant for light, nutrients, water, space and other growth requirements and reduce the crop yield.
- Increase the cost of production by increasing the cost of labour.
- Reduce the quality of crop products.
- Exude inhibitors from the roots reduce the growth of the crop plants (allelopathy).
- Serve as alternate hosts for insects and pathogens.
- Reduce the efficiency of farm implements.
- Harbor birds and rodents.
- Reduce the sales value of the land.
- Reduce fertility status of the soil.
- Limit the choice of crop for a land. Some crops may not complete effectively against heavy weed growth and some weeds are parasite on crops.
- Cause root and another crop damage may occur from weed control operation.
- Cause serious illness or death of farm animals by their poisonous constituents.
- Injure the cattle body by their spines.
- Increase the cost of maintenance of sports and recreation, highways, railways and other public utilities.
- Cause annoyance to human being by plugging in cloths.
- Aquatic weeds contaminate water bodies and on decomposition spread the odours and pollute the atmosphere.

Due to the above all mentioned problems of weeds by adoption of weed management practices we can reduce the weed density in early crop growth period of crops. Weed control in different crops and cropping systems and the control of problem weeds in a given area, is feasible through adoption of IWM practices. Herbicide use should be only one of the options but not the only option. Any one or more weed control practices given below need to be integrated to prevent weeds or to achieve long term weed control in farmers' fields.

Preventive Measures to Reduce Weed Density

- Deep ploughing after summer showers and need based land levelling once in 2-3 years will reduce the annual as well as perennial weeds like *Cyperus* and *Cynodon*.
- Repeated preparatory cultivation of land with gorru and guntakka before sowing by utilizing the early monsoon showers exhausts the weed seed in top layers of soil.
- Clean cultivation and keeping the farm surroundings weed free reduces the weed seed bank in the area.
- Crop rotation to be followed to avoid parasitic weeds like Cuscuta, Orabanche, Striga etc.
- Use of weed free crop seed for sowing, avoiding FYM infested with weed seeds for field application, will help in avoiding introduction of new weed seed in to fields.
- Destruction of left over weeds after crop harvest reduces the soil seed load for the next crop.

Cultural and Mechanical Methods:

- Maintenance of optimum crop stand to achieve proper field coverage and to smother weeds with in the field
- Sowing the crops in lines to facilitate inter cultivation
- As far as possible inter cultivation by using different mechanical measures is to be done
- The left over weeds after adoption of different control measures (chemical) need to be hand pulled before seed setting in order to prevent weed seed bank in soil.

CHEMICAL WEED CONTROL:

1. Rice

A) Direct sown Rice:

i) Drill sowing in optimum soil moisture:

Before sowing:

When the fields are infested with weeds viz., *Cyperus spp.*, *Cynodon dactylon*, *Echinochloa spp*. and when the weeds are in active growing stage, spray10 ml of paraquat dichloride 24% SL or 15 ml of glufosinate ammonium 13.5% SL or 10 ml glyphosate 41% + 10 g. Ammonium sulphate/ Urea per 1.0 l of water. After 10-15 days, sowing can be done after ploughing under optimum moisture condition.

Pre emergence:

Spray pendimethalin 30% @ 2.50 to 3.75 l/ha or pretilachlor 50% @ 1.0 l/ha immediately after sowing or the next day.

Post emergence:

- At 15-20 days after sowing, when grassy weeds like *Echinochloa spp*. are dominant, spray of cyhalofop butyl 10% @ 1.0 l/ha.
- At 15-20 days after sowing, when both grasses and broad leaf weeds are present, spray of bispyribac sodium 10% @ 200 ml/ha.
- After 30 days of sowing, when dicot weeds are problematic, spray 2,4-D sodium salt 80% @ 0.75 to 1.0 kg/ha or2,4-D amine salt 58% EC @ 0.75 to 1.0 l/ha @ or ethoxysulfuron 15% @ 125 g/ha. After 30 days of sowing, when both grasses and broad leaf weeds are present, spray metsulfuron methyl (10%) + chlorimuron ethyl (10%) @ 20 g/ha.

ii) Broadcasting or drum seeding in Puddled field:

Pre emergence:

- Oxadiargyl 80% @ 90 g/ha or pyrazosulfuron ethyl 10% @ 200 g/ha in 1.25 l of water and apply as sand mix application (50kg sand/ha) in a thin film of water at 3-5 days after sowing. For post emergence application, follow the package as given in the drill sown rice.

B) Transplanted rice:

i) Nursery:

a) Pre emergence:

- In case of dry nurseries, spray pretilachlor 50% @ 1.0 l/ha immediately or within two days after sowing for the control of *Echinochloa* and other annual monocot and dicot weeds.
- In case of wet nurseries, mix oxadiargyl 80% @ 90 g/ha in 1.25 l of water and apply as sand mix application (50kg sand/ha) at 3 to 5 days after sowing in a thin film of water.

B) Post emergence

- Spray cyhalofop butyl 10% @ 1.0 l/ha at 15 days after sowing for the control of *Echinochloa spp.*
- Spray of bispyribac sodium 10% @ 200 ml/ha at 15 days after sowing for the control of grasses and broad leaf weeds.

ii) Main field:

Within 3 to 5 days after planting (as sand mix application at 50kg sand /ha):

- For the control of Echinochloa and other annual grassy weeds,
- Apply butachlor 50% @ 2.5 to 4.5 l/ha (or) Apply anilophos 30% @ 1.33 to 1.67 l/ha (or) Pretilachlor 50% @ 1.0 l/ha.
- When both grasses and broad leaf weeds are present, Apply 2, 4-D ethyl ester4% granules @ 10 kg ha^{-1} + butachlor @ 2.5 l/ha (or) 2, 4-D ethyl ester 4% granules @ 10 kg ha^{-1} + anilophos 30% @ 0.70 l/ha (or) 2,4-D ethyl ester 4% granules @ 10 kg/ha + butachlor 5% granules @ 10 kg/ha (or) bensufuron methyl(0.6%)+ pretilachlor (6.0 %) granules @ 10 kg/ha (or) oxadiargyl 80% @ 125 g/ha.

At 15-25 days after transplanting:

When both grasses and broad leaf weeds are present. spray bispyribac sodium 10% @ 250 ml/ha

At 25-30 days after planting:

- When dicot weeds are problematic : Spray 2,4-D sodium salt 80% @ 0.75 to 1.0 kg/ha (or) Spray 2,4-D amine salt 58% @ 0.75 to 1.0 l/ha (or) Spray ethoxysulfuron 15% @ 125 g/ha
- When grassy and dicot weeds are problematic: spray metsulfuron methyl (10%)+chlorimuron ethyl (10%) @ 20 g/ha.

2. MAIZE

Upland maize:

Pre emergence: (immediately or within three days after sowing)

- Spray atrazine 50% @ 2.5 to 3.5 kg/ha (or) Spray alachlor 50% @ 3.75 to 5.0 l/ha (or) Spray pendimethalin 30% @ 2.50 to 3.75 l/ha (or) Spray oxyfluorfen 23.5% @ 500 ml/ha.

Post emergence: (at 20-25 days after sowing)

- For the control of dicot weeds, spray 2,4-D sodium salt 80% @ 0.75 to 1.0 kg/ha or 2,4-D amine salt 58% @ 0.75 to 1.0 l/ha (or) .
- When grassy and dicot weeds are problematic, spray topramezone 33.6% @ 75 ml/ha or tembotrione 34.4% SC @ 286 ml /ha.
- When Cyperus infestation alone is very high, spray halosulfuron 75%WG @ 90 g/ha as post emergence spray

Zero tillage maize in rice fallows:

Pre emergence:

- Atrazine 50% @ 2.5 kg/ha + paraquat 24% @ 2.5 l/ha.
- spray atrazine 50% @ 2.5 kg/ha+ glyphosate 41% @ 4.0 l/ha (when perennial weeds are present)

Post emergence :

- for the control of dicot weeds, spray 2,4-D sodium salt 80% @ 0.75 to 1.0 kg/ha or 2,4-D amine salt 58% @ 0.75 to 1.0 l/ha.
- When grassy and dicot weeds are problematic, spray topramezone 33.6% @ 75 ml/ha or tembotrione 34.4% SC @ 286 ml /ha.

3. SORGHUM

- Spray atrazine 50% @ 1.5 - 2.0 kg/ha immediately after sowing or the next day.
- For the control of dicot weeds, spray 2, 4-D sodium salt 80% @ 0.75 to 1.0 kg/ha at 30 to 35 days after sowing.

Zero tillage sorghum in rice fallows:

Pre emergence:

- Spray atrazine 50% @ 1.5- 2.0 kg/ha+ glyphosate 41% @ 4.0 l/ha (or) Atrazine 50% @ 1.5-2.0 kg/ha + paraquat 24% @ 2.5 l/ha.

Post emergence:

For the control of dicot weeds, spray 2,4-D sodium salt 80% @ 0.75 to 1.0 kg/ha or 2,4-D amine salt 58% @ 0.75 to 1.0 l/ha.

4. RAGI

- Spray pendimethalin30% @ 2.5 l/ha immediately after sowing or before transplanting
- Spray anilophos 30% @ 1.75 l/ha one week after transplanting ragi seedlings
- Spray 2,4-D sodium salt 80% @ 0.75 to 1.0 kg/ha at 25-30 days after transplanting ragi seedlings

5. KORRA

- Sprayatrazine 50% @ 1.2 kg/ha immediately after sowing or within one or two days
- Spray metsulfuron methyl (10%) + chlorimuron ethyl (10%) @ 15.0 g/ha at 20-25 DAS.

6. PULSES

a) PULSES - UP LAND:

- Spray pendimethalin 30% @ 2.50 to 3.75 l/ha or alachlor 50% @ 3.75 l/ha as pre emergence application immediately after sowing or the next day.
- If grassy weeds are problematic, post emergence spray of fenoxaprop ethyl 9% @ 625 ml/ha or quizalofop ethyl 5% @ 1.0 l/ha or propaquizafop ethyl 10% @ 625 ml/ha at 20 days after sowing
- For the control of grasses and broad leaf weeds post emergence spray of imazethapyr 10% @ 500 ml/ha or fomesafen 11.1%+fluazifopbutyl 11.1%@ 1.0 l/ha at 15-20 days after sowing.
- For the control of grasses and broad leaf weeds after 25-30 days of sowing post emergence spray of acifluorfen16.5% + clodinafop propargyl 8% @ 1.0 l/ha.

b) Rice fallow blackgram

- For the control of *Echinochloa* spp. and broad leaf weeds, apply benthiocarb @ 2.5 to 5.0 l/ha or pendimethalin 30% @ 2.0 to 3.75 l/ha immediately after removal of paddy sheaves as sand mix application followed by spraying of water up to 1000 l/ha depending upon the soil moisture condition. Prefer pendimethalin for fields infested with cuscuta.
- For control of *Echinochloa spp*., spray fenoxaprop ethyl 9% @ 625 ml/ha or propaquizafop ethyl 10% @ 625 ml/ha (or) quizalofop ethyl 5% @ 1.0 l /ha as post emergence spray at 15-20 days after sowing.
- For control of grasses and broad leaf weeds, post emergence spray of imazethapyr 10% @ 500 ml /ha or fomesafen 11.1%+fluazifopbutyl 11.1%@ 1.0 l/ha at 15-20 days after sowing.
- At 25-30 days after sowing, if cuscuta patches exist in field, spray paraquat 24% @ 5.0ml per l of water on the patches to kill the parasite and to prevent seed setting.
- For control of *Vicia sativa*, spray acifluorfen (16.5%) + clodinafop propargyl (8%) @ 1.0 l/ha as post emergence application at 25-30 days after sowing.

7. GROUNDNUT

- Spray pendimethalin 30% @ 2.5 to 3.75 l/ha or alachlor 50% @ 3.75 to 5.0 l/ha immediately or within three days after sowing.
- For control of grassy weeds, spray fenoxaprop ethyl 9% @ 625 ml/ha or quizalofop ethyl 5% @ 1.0 l/ha or propaquizafop ethyl 10% @ 625 ml/ha as post emergence spray at 15-20 days after sowing.
- For control of grasses and broad leaf weeds, post emergence spray of imazethapyr 10% @ 625 ml /ha at 15-20 days after sowing

8. SESAMUM

- Spray pendimethalin 30% @ 2.5 l/ha or alachlor 50% @ 2.5 l/ha immediately or within three days after sowing
- For control ofgrassy weedsspray fenoxaprop ethyl 9% @ 625 ml/ha or quizalofop ethyl 5% @ 1.0 l/ha as post emergence spray at 20 days after sowing.

9. COTTON

- Spray pendimethalin 30% @ 2.5 to 3.75 l/ha immediately or within 3 days after sowing
- Spray quizalofop ethyl 5% @ 1.0 l/ha + Pyrithiobac sodium 10% @ 625 ml/ha as tank mixture at 20-25 days after sowing if inter-cultivation is not possible due to incessant rains. Fenoxaprop ethyl 9% or propaquizafop ethyl 10% @ 625 ml/ha can be used in place of quizalofop ethyl.

10. SUGARCANE

- Spray atrazine 50% @ 5.0 Kg/ha (or) metribuzin 70 % @ 1.5 kg/ha immediately or within three days after planting sugarcane sets.
- Spot application of paraquat 24% @ 5 ml per litre of water for the control of emerged weeds at 7-10 days after planting without any problem to planted sets in the soil.
- Post emergence spray of 2,4-D sodium salt 80% @ 2.0 kg/ha (or) 2,4-D sodium salt 80% @ 2.0 kg/ha +metribuzin 70% @1.0 kg/ha at 25-30 days after planting.
- At 75 days after planting, if twining weeds viz., *Ipomoea*, *Convolvulus* are problematic, spray 2,4-D Na salt 80% @ 1.6 kg/ha (or) 2,4-D amine salt 58% @ 1.25 l/ha (or) metsulfuran methyl + chlorimuron ethyl @ 20g/ha as post emergence directed spray.

11. PERENNIAL WEEDS IN ORCHARDS

- Perennial weeds like *Cyperus rotundus*, *Cynodon dactylon etc.* in orchards can be controlled effectively by spraying glyphosate 41% @ 2.5 to 5.0 l/ha dissolved in 500 litres of water using hood. Falling of the spray fluid on young fruit plant foliage should be avoided. Second spray is required when there is re growth of weeds. Application of glyphosate with 1% ammonium sulphate enhances the up take and translocation by weeds.
- Ammonium salt of glyphosate 71% @ 2.5-4.0 l/ha can be used as an alternative.
- If annual grasses and dicot weeds are prevalent or when glyphosate is not available in market, the herbicide paraquat 24% @ 2.5 to 3.75 l/ha dissolved in 500 l/ha of water can be sprayed using hood. Falling of spray fluid on fruit trees should be avoided
- The efficacy of the herbicide depends upon the stage of the weed (should be in active vegetative stage), age and duration of infestation (older and longer duration of infestations may require several repeated sprays on active vegetative growth), soil moisture and type of weed and nature of foliage (surface morphology/ herbicide retention and absorption).

Precautions to be taken while applying the herbicides:

1. Before applying / selecting a suitable herbicide and its dose, information on cropping system, weed growth stage, weed species and density, soil type, crops around are to be considered.
2. Herbicides need to be applied for the recommended crops in recommended rates /dose and by recommended method only
3. New / unknown herbicides should not be used/recommended without prior knowledge of its mode of action and residual effect.
4. Separate sprayer need to be maintained for herbicide spraying, preferably a battery operated knapsack sprayer, with a flat fan/ flood jet nozzle.

5. As the herbicides are also equally poisonous as the other pesticides, proper care need to be taken while handling, spraying & storage.
6. A spray volume of 200 -250 l of clean water is required for one acre depending upon the stage of the crop. While spraying care is to be taken not to overlap the area already sprayed.
7. Herbicide spraying may be avoided if the crop is under moisture stress or when the wind speed is high (> 10 kmph) or temperature is high or when rain is expected.
8. In an intercropping system, the herbicide need to be selective for both the component crops. Spraying of Acifluorfen 16.5% + clodinafop propargyl 8% (Iris, patela) in redgram + greengram/blackgram inter cropping, may cause damage to redgram crop.
9. Tank mixing of 2 or more herbicides or with other pesticides need to be avoided without a valid recommendation.

REFERENCES

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