A Review on Integrated Weed Management in Green Gram

Mousumi Dash*, Manju Tandon and Suvasmita Mohapatra

Department of Agronomy, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar-751 003, Odisha, India

*Corresponding author

Abstract

Although Green gram is the third important pulse crop, it only covers 3.77 million ha land and having a production of 1.52 million tons which is very low compared to other crops. The pulse is widely used as a protein source and fodder crop. The area covered and production is low due to different factors i.e. unavailability of nutrient rich soil, lack of quality seeds, unsuitable climatic factors, traditional cultivation practices, improper weed management, poor postharvest management etc. Among these factors, the improper weed management practices and weed infestation cause the maximum damage to the crop and its production which is the vital constraint reducing the crop potentiality in green gram. Integrated weed management is an important input to the pulse crop to increase its yield and production potentiality by checking the effects of weed infestation, weed competition.

Keywords
Green gram, Weed infestation, Crop weed competition, Pre-emergence, Integrated weed management

Introduction

Greengram is the third important pulse crop of India in terms of area 3.77 million ha and production 1.52 million tons (DAC, 2015). It is the cheapest source of dietary protein. It can be grown in all the seasons of the year as seed crop also as fodder crop. Green gram improves the soil health and maintains its environment. Weed infestation is one of the major constraints in greengram cultivation and causes 50 to 90 % yield loss (Kumar et al., 2006). Competition with the weeds leads to 30 to 80 % reduction in grain yield of greengram during summer and kharif seasons while 70-80% during Rabi season respectively. (Algotar et al., 2015). (Sheoran et al., 2008) reported that the weed infestation if not checked within 20 DAS there would be a severe yield reduction to an extent of 38 per cent in contrast to 20 per cent yield reduction with unchecked weed infestation till 20 DAS in greengram. Losses due to uncontrolled weed growth up to95% in wet season and 77% in dry season (Ramanamurthy and Rao, 1996).

Common weed spectrum found in green gram

Weed flora in green gram crop differ from region to region with soil conditions. One should have good knowledge about the persisting weed flora for better management to gain more yield. The major weed flora
found in loamy sandy soil of Bikaner, Rajasthan were *Amaranthus spinosus*, *Digera arvensis*, *Trianthema portulacastrum*, *Gisekiaporedious*, *Euphorbia hirta*, *Aristida depressa*, *Portulaca oleracea*, *Cenchrus biflorus*, *Cleome viscosa*, *Tribulus terrestris*, *Corchorus tridense*, *Cyperus rotundus*, *Eleusineverticillata*, *Eragrostistennela* and *Aervatomentosa* (Komal et al., 2015).

*Digitaria sanguinalis*, *Cynodon dactylon*, *Eleusine indica*, *Echinochloa colona* among grasses; *Cyperus rotundus* among the sedges and *Cleome viscosa*, *Chenopodium album*, *Euphorbia hirta*, *Digeria arvensis*, *Physalis minima* and *Amaranthus viridis* among the broadleaved weeds were the dominant weeds in sandy loam soil of Nadia, West Bengal (Tamang et al., 2015).


*Raman and Krishnamoorthy* (2005) reported that *Trianthema portulacastrum*, *Amaranthus viridis*, *Phyllanthus nirurias* broad leaf weeds and *Cynodondactylon*, *Echinochloacolonum* and *Eleusineindicaas* grasses were the major weed flora in clayloam soils of Annmalainagar, Tamilnadu in rice fallow season greengram.

In the sandy loam soil of Nadia, WB; the commonly noticed grass weeds were *Echinchloacolona*, *Echinchoacrussgalli*, *Digitariasanguinalis*, *Eleusineindicaetc*; sedge weed was *Cyperus rotundus* and broad-leaved weeds were *Physalis minima*, *Alternanthera sessilis*, *Euphorbia hirta*, *Cleome viscosa*, *Chenopodium album* etc (Kundu et al., 2009).


The important weed flora in rabigreengram were *Cyprus rotundus*, *Trianthemaportulacastrum* and *Eragrostistenella* were the major weed flora in sandy loam soils of Ludhiana, Punjab insummer greengram.
Euphorbia hirta, Convolvulus arvensis, Eclipta alba, Vernonia cinerea, Phylanthus maderaspentesis, Physalis minima and Trianthema portulacastrum in Navsari, Gujarat (Raj et al., 2012).

**Crop weed competition**

Weeds spread easily, because of their enormous seed production and once established are not easily eradicated. Life cycle of most of them coincide with that of crop they invade, thus ensuring mixing of their seed with those of the crops (Mahroof et al., 2009). Due to diversity, weeds are major threat to agriculture and they out-compete crops for natural resources utilization (Chhodavadia et al., 2013). Crop need a weed free period of first 30 days, as the crop is short statured which suffers badly if weeds are not controlled at early stage (Mirjha et al., 2013). Weed competition with mungbean persisting for 20-30 days after emergence was very critical and prolonged competition resulted in substantial yield reduction (Naeem et al., 2015). Singh et al., (1996) observed that grain yield of summer green gram was reduced by34.88% due to competition with weeds during the first 30 days after sowing which increased to 49.15% when weeds competed with the crop for the entire crop season.

Yield losses in green gram due to weeds have been estimated to range between 30-50 % (Kumar et al., 2004).

Mishra et al., (2000) observed that Competition with the weeds throughout the crop season reduced the seed yield of mungbean by 83.3% and from a field experiment, Shuaib (2001) reported that weed competition reduced mungbean yield to the tune of 65.4 percent.

According to Randhawa et al., (2002) seed yield reduction upto 46.8% due to unweeded control; whereas according to Raman and Krishnamoorthy (2005) presence of weeds reduced the seed yield of mungbean by 35%.

Dungarwal et al., (2003) observed that the loss of mungbean yield due to weeds ranges from 65.4% to 79.0%.

**Effect of weed management on nutrient uptake**

Komal et al., (2015) conducted an experiment in kharif season at Bikaner, Rajasthan and found that weeds uptake 61.9 kg nitrogen, 12.1kg phosphorus and 51.3 kg potassium per hector whereas uptake by the crop was only 45kg nitrogen, 6.02 kg phosphorus and 46.3 kg potassium per hector respectively in weedy check plot.

Studies conducted at Junagadh (Gujarat)
during summer season revealed that maximum amount of nutrient was up taken by weeds in weedy check plot i.e. 31.0, 28.7, 1.9 kg ha\(^{-1}\) nitrogen, phosphorus and potassium and it was minimum in case of the crop i.e. 18.2, 24.9 and 4.7 kg ha\(^{-1}\) nitrogen, phosphorus and potassium whereas the crop uptake was maximum of 23.0, 40.5 and 7.8 kg ha\(^{-1}\) nitrogen, phosphorus and potassium in weed free plot (Chhodavadia et al., 2013).

Kaur et al., (2010) carried out an experiment on summer mungbean at Ludhiana, Punjab during summer 2003 to study the effect of weed control in summer mungbean and the results revealed that the maximum nutrient removal by weeds was observed in unweeded control i.e. 68.90, 19.29 and 77.17 kg ha\(^{-1}\) of N, P and K respectively and the minimum in case of pendimethalin 0.75 kg ha\(^{-1}\) i.e. 8.70, 3.17 and 11.57 kg ha\(^{-1}\) of N, P and K respectively. They further noted that two hoeing at 25 and 40 DAS removed the highest amount of nitrogen i.e. 107.78 kg ha\(^{-1}\). Similarly, phosphorus removal by the crop was the highest in two hoeing with wheel hoe at 25 and 40 DAS and high potassium uptake (82.71 kg ha\(^{-1}\)) was in pendimethalin 0.75 kg ha\(^{-1}\).

**Weed management strategies**

**Mechanical and manual weeding**

From the experiment conducted by Algotar et al., (2015) at Navsari (Gujarat), it is concluded that keeping the field weed free up to harvest (2 hand weeding and hoeing) gives the highest grain and haulm yield.

Chaudhari et al., (2016) indicated that hand weeding at 20 and 30 DAS and hand hoeing at 20 and 30 DAS lead to an enhancement of 3.4 %, 3.6 % yield of summer green gram over weedy check.

Chhodavadia et al., (2014) at Junagadh (Gujarat) found that hand weeding at 20, 30 and 40 DAS reduced weed infestation most efficiently throughout the growing period of the crop and as a consequence it produced the highest seed yield of summer green gram.

Patel et al., (2015) observed that at Anand (Gujarat) inter culturing followed by hand weeding carried out at 20 and 40 DAS was more effective in controlling weeds and gave more yield as compared to pendimethalin 500 g/ha as PE fb IC + HW at 30DAS.

Patil et al., (2014) reported that at Akola, Maharashtra, hand weeding + 1 hoeing increased the grain yield by 68.9% over control.

Patel et al., (2015) at Navsari, Gujurat concluded that two hand weedings along with hoeing at 20 and 40 DAS or two hand weedings at 20 and 40 DAS are found most appropriate and profitable weed management practices.

**Chemical control**

As manual weeding is laborious and time consuming so farmers prefer for chemical weed control.

Poornima et al., (2017) concluded that the combinations of Haloxyfop-p-methyl at 135 g/ha + Imazethapyr at g/ha, and Quizalofop ethyl at 50 g/ha + Imazethapyr at 75 g/ha applied at 12-15 days after sowing of green gram as an early post-emergence can be recommended for weed control in greengram in Southern Zone of Telangana for getting higher yield during kharif.

Application of Vellore 32 (Pendimethalin 30 EC + Imazethapyr 2 EC)@1.00 kg a.i. ha\(^{-1}\) was found most effective in reducing population and dry mass of weeds and producing maximum yield of green gram at
Nadia, West Bengal (Tamang et al., 2015). Singh et al., (2016) conducted an experiment at Bihar and concluded that application of herbicide Pendimethalinat 1.0 kg ha\(^{-1}\) as pre-emergence was most effective and superior no application of herbicides for controlling of weeds and achieving maximum seed and stover yield of green gram.

Ali et al., (2011) in Sardarkrushinagar (Gujarat) concluded that under constraints of labour availability, maximum yield, net profit and effective weed control in green gram crop can be achieved with application of Imazethapyr or Quizalofop-p-ethyl 100 g/ha 15-20 days after sowing.

**Integrated weed management**

The conventional methods of weed control (hoeing or hand weeding) are labour intensive, expensive, insufficient and may cause damage to the crop. Chemical weed control is not common as the use of herbicides may be uneconomical due to low yield potential of greengram (Reddy, 2004). So, to avoid the ill effects of using a single method, use of integration of all possible methods can prove better yield and maximum benefit.

Singh et al., (2015) concluded that Pendimethalin (pre) 1000g a.i./ha +1 hand weeding minimizes total weed density throughout the crop growth period and produces maximum yield.

At Navsari; Raj et al., (2012) conducted an experiment during 2005-2008 by comparing different methods of weed control and concluded that higher seed and haulm yields with higher weed control efficiency were obtained with two hoeing at 20 and 40 DAS and was followed by pendimethalin as pre-emergence 0.75 kg/ha + one hand weeding at 40DAS.

Kundu et al., (2009) from Nadia, West Bengal reported that integrated weed management practices with quizalofop-p-ethyl @ 50 g a.i. ha\(^{-1}\) at 21 DAE + hand weeding at 28 DAE produced the highest yield attributes, seed yield and benefit: cost ratio in mungbean cultivation compared with application of herbicide alone.

Raman and Krishnamoorthy (2005) in Annamalai Nagar revealed that green gram produced highest yield with the application pendimethalin @ 1.0 kg/ha plus one hand weeding on 20 DAS.

From the above stated reviews, it is revealed that weeds cause a great loss in crop production and they should be managed to an extent that there should no economic losses due to weeds. Due to shortage of labor and environment polluting effects of chemicals it is necessary to adopt integrated weed management for sustainable development and higher yield potential of green gram crop.

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