

WEED INTENSITY AND ONION BULB YIELD AS INFLUENCED BY DIFFERENT WEED MANAGEMENT PRACTICES

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Abstract: Weeds are serious problem in all vegetable crops but they are even more so in *kharif* season crops. The problem of controlling weeds has been taken by studying various cultural and chemical method to the extent of different degrees of success by workers all over the world. In this chapter, a brief review of various experimental findings of different experiments covering important aspect of weed flora, losses caused by weeds and effect of weed management practices on crops, yield and yield attributes, use of chemical and cultural methods of weed management and economics is given below.

Keywords: Weed management practices, oxyfluorfen, pendimethalin, Onion

INTRODUCTION

Onion, botanically known as *Allium cepa* L. is one of the most important vegetable crops, native of Central Asia and Mediterranean region and belongs to the family Alliaceae. The second largest producer of onion in the world and occupies 1087.20 thousand ha area with a production of 17511.10 thousand tonnes and productivity 16.10 t/ha (Anon., 2013). Onion is slow growing, shallow rooted crop with narrow, upright leaves and non branching habit. Due to this type of growing habit, onion is used as raw, vegetable and spice all over the world. It is a bulbous annual and biennial herb. Onion bulb and greens both are rich in vitamin C, potassium, dietary fibers, minerals and folic acid. The pungency of onion is due to volatile oil known as allyl- propyl disulphide. The colour of outer skin of onion bulbs is due to quercetin. The productivity of *Kharif* onion is very low as compared to other seasons, because it is affected by diseases, pests and weeds. The chemical and conventional methods of weed control offer the possibilities of increasing crop production. Keeping abreast with the above facts, the present investigation was undertaken to evaluate the different weedicides for controlling weeds in *Kharif* onion. Onion crop cannot compete well with weeds. In addition to this, frequent irrigation water and fertilizer application allows for successive flushes of weeds in onion. Yield loss due to weed infestation in onion has been recorded to the tune of 40 to 80% (Channappagoudar and Biradar, 2007).

Weed flora composition and degree of their population

The composition of weed flora and degree of their population in onion fields has been found to vary from place to place and even at the same place from year to year depending upon the agro climatic conditions and cultural practices. Pandey (2000) reported that the major weed flora in onion consisted

Galinsoga parviflora, *Brachiaria ramosa*, *Cyperus rotundus*, *Cannabis sativa*, *Polygonum plebeium*, *Fumaria parviflora*, *Phalaris minor* and *Oxalis latifolia*. Amrutkar *et al.* (2002) recorded that the major weed flora in onion consisted *Cyperus rotundus*, *Cynodon dactylon*, *Dinebra retroflexa*, *Parthenium hysterophorus*, *Chenopodium album*, *Anagallis arvensis*, *Argemone maxicana*, *Physalis minima*, *Euphorbia geniculata*, *Lagasca mollis* and *Portulacea oleracea*. Syed and Malik (2001) reported that the major weed flora in onion consisted *Amaranthu shybridus*, *convolvusarvensis*, *Cyprusrotundus* *Chenopodium album*, *Echinochola spp.*, *Sophora alopecuroides* were the most damaging. Sukhadia *et al.* (2002) recorded that the major weed flora in percentage at Junagarh during *kharif* season were *Echinochloa colonum*, (31%), *Eluopus villosus*(10%), *Dactyloctenium aegyrium* (3%), *Digera arvensis* (16%), *Phyllanthus nirusi* (8%), *Cyperu rotundus* (14%) and *Cyperus iria* (2%). Ahuja *et al.* (2003) observed that the dominant weed species in the experimental field was *Poa annua* in both cabbage and onion crops and *Cyperus rotundus* in onion among the narrow-leaf weeds. *Trianthema portulacastrum*, *Chenopodium spp.*, *Trigonella polycerta* [*T. polyceratia*], *Medicago denticulata*, *Lepidium sativum* and *Anagallis arvensis* in both cabbage and onion crops, *Amaranthus spp.* and *Tribulus terrestris* in onion among the broad-leaf weeds.

Losses caused by weeds

Onion being the poor competitor crops, especially the *kharif* season crop suffers severely from weeds, which usually compete with crop plants for moisture, light, nutrients and space. Weeds also interfere with the development of onion bulbs and decrease the yield upto the extent of 40-80 per cent (Singh *et al.*, 1992). Verma and Singh (1996) observed that due to long crop duration, slow initial growth, poor canopy cover and short spaced

crop, onion is seriously affected by weeds. Weed competition reduces bulb yield upto 57 per cent in *kharif* season. Ved *et al.* (2000) reported that season- long crop –weed competition reduced the bulb yield by 81.2 per cent as compared with weed free condition. Kolhe (2001) recorded reduction in bulb yield to the extent of 78.63 per cent due to weed competition under weedy control. Qasem (2005) observed that weed competition reduced average onion fresh yield by 62 per cent as compared with the weed- free control. Sangeeta *et al.* (2008) reported that critical period of crop-weed competition in onion. The result showed that weed population count decreased with increase in weed free environment in both the years. The loss of yield under un-weeded control over weed free environment maintained up to harvest was 84.71 per cent.

Effect of weed management practices

Crop growth and development

Weed is very dangerous for crop growth and development. Singh and Singh (1993) showed that weed free treatment produced the maximum plant height, numbers of leaves plant⁻¹, bulb diameter, fresh weight of bulb, dry weight of leaves, bulb and bulbs yield was however at par with pendimethalin and oxadiazon @1.5 kg ha⁻¹ with one HW. Minimum value of crops parameters were recorded under weedy check control. Saikia *et al.* (1997) indicated that Fluchloralin (0.5 or 1.0 kg ha⁻¹) alone or in combination with one HW (after 60 days) or HW (after 40 and 60 days) reduced weed dry weight significantly and improved onion plant growth and bulb development. Ved *et al.* (2000) observed that Alachlor at @ 2.0 kg ha⁻¹ + HW at 45 DAT being at par with pendimethalin at @ 1.5 kg ha⁻¹ + HW at 45 DAT and weed- free, proved to be the superior integrated weed control approach to control weeds and increased the plant height, bulb diameter and bulb weight. Nandal and Singh (2002) also reported that fluchloralin @ 1.0 kg in combination with one HW at 45 DAT proved to be the significantly superior in increasing the plant height and number of leaves per plant and remained at par with Oxyfluorfen @ 0.15 kg ha⁻¹ with one HW at 45 DAT.

Yield and yield attributes

There are many literatures on the effects on yield and their attributes due to weed population and intensity. Sandhu *et al.* (1993) observed that all weed control treatments reduced weed DW from untreated control values of 3350-4030 kg ha⁻¹ to 330-1240 kg ha⁻¹ and increased onion bulb yields from 3030-8570 kg ha⁻¹ to 14760-22460 kg ha⁻¹.

Pendimethalin at 0.75 kg resulted in the greatest crop yields, Singh and Singh (1993) observed that Oxyfluorfen @ 1.0 kg ha⁻¹ with one HW at 50 DAT (295.70 q ha⁻¹) when applied at higher rate gave significantly better yield than applied at lower rate but this is not true in case of trifluralin and alachlor where, non significant increase was observed. Porwal (1995) reported that superiority of Pendimethalin in controlling weeds in onion resulting in increased yield of bulbs. Similarly, Sandhu *et al.* (1993) also opined out similar results of pendimethalin and fluchloralin in onion and garlic. Saikia *et al.* (1997) screened that Fluchloralin (1.0 kg ha⁻¹) + one HW at 40 DAT resulted in the greatest bulb yield (16.9 t ha⁻¹), followed by the weed- free treatment (16.0 t ha⁻¹). Verma and Singh (1997) found that weed population and weed dry weight m⁻² were lowest in plot treated with @ 1.5 kg ha⁻¹ pendimethalin in onion. Yadiraju and Ahuja (1999) showed that post-emergence application of fluchloralin @ 0.9 kg ha⁻¹, oxadiazon @ 0.75 kg ha⁻¹ and oxyfluorfen @ 0.24 kg ha⁻¹ at 25 DAT gave lower bulb yield and remained at par with unweeded control. Pandey (2000) also recorded the maximum yield of bulb (227.76 q ha⁻¹) with application of pendimethalin @ 1.0 kg ha⁻¹ which was significantly higher as compared to the yield obtained under weed check (163.22 q ha⁻¹). Yadav *et al.* (2000) reported from Hisar that weed free treatment recorded the higher bulb yield of 323.45 q ha⁻¹ which was statistically at par with Pendimethalin @ 1.5 kg ha⁻¹. However, the highest net income and yield of bulbs was recorded with the application of oxyfluorfen @ 0.15 kg ha⁻¹ closely followed by pendimethalin @ 1.5 kg ha⁻¹ due to effective control of weeds during critical period of crop-weed competition. Kolhe (2009) recorded that Pre-emergence application of Oxyfluorfen @ 0.15 kg ha⁻¹ supplemented with one HW at 35 DAT was equally effective to that of two HW at 20 and 35 DAT in alleviating weed competition and bulb yield in the range of 159.36-447.25 per cent was observed due to adoption of weed management practices. Nandal and Singh (2002) recorded the highest bulb yield (304.43 q ha⁻¹) and net returns (Rs 60 196 ha⁻¹) with the application of oxyfluorfen (0.25 a.i. kg ha⁻¹) + HW at 40 DAT. The lowest weed density at all the stages of crop growth was observed under oxyfluorfen (0.37 a.i. kg ha⁻¹). Ramachandraprasad *et al.* (2002) reported the highest bulb yield in the weed free plot

(15.4 t ha⁻¹), which was equivalent with those in the herbicide treatments, except fluchloralin. Ghaffoor (2004) observed that plots treated with pendimethalin at 3 liters/ha gave the highest yield (40.28 t ha⁻¹) and weight of bulbs (127.9 g). Rathore and Shekhawat (2004) reported that fluchloralin applied @ 1.0 kg ha⁻¹ as pre-planting incorporation in combination with one HW at 45 DAT proved to be most effective to control the weeds giving maximum weed control efficiency (92.56%) and bulb yield (121.42 q ha⁻¹) of *kharif* onion.

Use of chemical and cultural methods of weed management

A good and proper method for applying chemicals and cultural practices are very necessary for weed management. Sandhu *et al.* (1997) reported that pendimethalin 30 EC @ 2.5 kg and 1.87 kg ha⁻¹ and fluchloralin 45 EC @ 2.5 kg and 1.87 kg ha⁻¹ supplemented with one hoeing conducted after 105 days of sowing resulted in significant increase in bulb yield comparable to weed control. Singh *et al.* (1997) screened that 0.37 kg Oxyfluorfen was the most effective treatment for reducing population of *Poa annua*, *Coronopus didymus*, *Rumex acetosella* and *Medicago denticulate*, with 0.25 kg Oxyfluorfen + hand weeding next best. None of the treatments gave season-long reductions in *Cyperus rotundus* populations. Vanhala *et al.* (1998) studied the effects of physical weed control measures (hoeing, flaming once or 3 times, and hand weeding) on carrot (cv. Fontana) and onion (cv. Sturon) quality during 1992-94 at 2 locations in Finland. Weed free plots were maintained with prometryn 1 kg ha⁻¹ + hand weeding. In onion, weedy plots resulted in the lowest marketable yield. However, repeated flaming, although providing the best weed control, inhibited onion development resulting in poorer quality onion as compared with a single flaming treatment and hand weeding. Singh *et al.* (1998) studied the efficacy of oxyfluorfen, fluchloralin and pendimethalin applied alone and with one HW at 40 DAT and two HW at 40 and 60 DAT against *Cyperus rotundus*, *Medicago denticulate*, *Coronopus didymus*, *Poa annua*, *Rumex acetosella*, *Cynodon dactylon*. Oxyfluorfen applied @ 0.25 kg ha⁻¹ with one HW at 40 DAT gave the maximum net return followed by oxyfluorfen @ 0.37 kg ha⁻¹.

Weed control efficiency

Weed control efficiency is very important method for controlling of weed growth. Mishra and Sharma (1992) obtained the maximum weed control efficiency (79%) and minimum weed index (2%) has

been observed with fluchloralin @ 1.5 kg ha⁻¹ applied pre-planting incorporating and superimposed with one HW at 45 DAT in onion. Singh *et al.* (1997) reported that weed control efficiency computed for pre-plant incorporation of pendimethalin @ 1.0 kg ha⁻¹, fluchloralin @ 1.5 kg ha⁻¹ PPI with one HW at 30 DAT was found most effective in reducing the weed population in onion. Ved *et al.* (2000) reported that Alachlor @ 2.0 kg ha⁻¹ + HW at 45 DAT, being at par with pendimethalin at 1.5 kg ha⁻¹ + HW at 45 DAT and weed-free, proved to be the superior integrated weed control approach to control weeds and increased the plant height, bulb weight and weed control efficiency. Ramachandraprasad *et al.* (2002) observed the highest weed control efficacy with Oxyfluorfen @ 0.06 kg ha⁻¹ + HW, followed by metolachlor + HW. Rathore and Shekhawat (2004) reported that fluchloralin applied @ 1.0 kg ha⁻¹ as pre-planting incorporation in combination with one HW at 45 DAT proved to be the most effective to control the weeds, giving maximum weed control efficiency (92.56%) and bulb yield (121.42 q ha⁻¹) of *kharif* onion at Ajmer.

Economics

Weed control mechanism is a very effective to maintain economics parameter regarding cost-benefit ratio, internal net return etc. Saikia *et al.* (1997) observed the maximum cost-benefit ratio (1:1.27) was obtained with Fluchloralin (1.0 kg ha⁻¹) + HW, Fluchloralin (0.5 kg ha⁻¹) + HW was more cost-effective than the weed-free treatment, due to reduced production costs. Unweeded plots led to a loss of 1662.97 Rs ha⁻¹. Nadagonda *et al.* (1998) also noted that pendimethalin @ 0.75 and 1.0 kg ha⁻¹ resulted in higher benefit: cost ratio than the unweeded control in onion. Singh and Singh (2000) obtained the maximum net profit with treatments pendimethalin @ 1.5 kg ha⁻¹ and pendimethalin @ 1.5 kg ha⁻¹ with one HW at 45 DAT in onion. Ved *et al.* (2000) reported that alachlor at 2.0 kg ha⁻¹ + HW at 45 DAT being at par with pendimethalin at 1.5 kg ha⁻¹ + HW at 45 DAT and weed-free, proved to be the superior integrated weed control approach to control weeds and also recorded high additional net returns. However, the highest additional returns per rupee invested were obtained with alachlor at 2.0 kg ha⁻¹.

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