Weed Management in Mustard (*Brassica juncea* L. Czern & Coss.): A Review

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Abstract

Indian mustard (*Brassica juncea*) is an important winter (*rabi*) season oil seed crop. It is also known as Rai or Laha. In India it's believed to be an introduction from China. It has been grown for oilseed, greens and as a spice. Mustard greens are an excellent source of vitamin A, vitamin B6, vitamin C, vitamin E and beta-carotene. It basically consists of folic, oleic, erucic and linoleic acids. The oil content varies from 37-49 per cent depending upon the type and variety of the crop. India is one of the leading oilseeds producing countries ranking third after United States of America and China with 21 per cent of world's area and 15 per cent of world's production. Oilseeds form the second largest agricultural commodity after cereals, sharing 13 per cent of the country's gross cropped area and accounts for nearly 5 per cent of gross national product (Reddy and Pati, 1998). In India, it occupies an area of 5,44, 500 hectares (Annual Report 2004) with production of 2,85,800 tonnes (Annual Report 2003) accounting for 33 per cent of total output of oilseeds (Singh and Singh, 1998). In Himachal Pradesh, it covers an area of 8.9 thousand hectares with a production of 3.24 million tonnes (Annual Report 2004). Among various components of production technology, weed control in Indian mustard needs due attention. As this crop is grown in poor soils with poor management practices, weed infestation is one of the major causes of low productivity (Singh and Singh, 1998).

The weeds depending upon the type, density and duration of competition accounts for 23-70 per cent reduction in yield of gobhi sarson (Tiwari 1998). Competition by weeds at initial stages is a major limiting factor to its productivity. However, during later stages the crop grows vigorously and has suppressing effect on weeds. Weeds are largely taken care manually. But manual weeding is tedious, cumbersome and labour intensive besides being costly. Therefore,

chemical weed control is the only alternative for effective control. The most common herbicidal weed control measure recommend in Indian mustard is the pre-emergence application of pendimethalin. But it does not control all grassy weeds. Farmers and extension functionaries require information on post emergence herbicidal weed control due to one or the other reason, if pre-emergence application of the herbicide was not made. Under situations when weeds are not taken care completely by pre-emergence application of herbicides, post-emergence herbicides may have an added economic advantage over super imposition of hand weeding. Therefore, it is imperative to find out an alternative weed management strategy for achieving season long weed control in Indian mustard. Keeping above points in mind, the present study entitled, Identification of different weeds on mustard crop with special reference to herbicides in Northern Hills zone of Chhattisgarh

Keywords: Weeds, mustard, herbicides and chhattisgarh

Introduction:

Indian mustard [*Brassica juncea* (L.) Czern & Cross] is one of the oil seed crop of the state of Madhya Pradesh. The problem of low productivity continues to be a major issue for agricultural planners and researchers. The best way to increase the productivity of mustard is by improving crops. Weeds are regarded as one of the major negative factors of crop produce loss due to competition for nutrient, moisture, light and space which have been reported as high as 30-70% (Tiwari,1998). Mustard crop is grown both in subtropical and temperate countries. India occupies the third position with regard to average production of rapeseed and mustard in the world. It is raised to 5.77 million hectares with an annual production of 6.59 million tonnes and average productivity of 1142 kg/ha in the country. In Madhya Pradesh rapeseed and mustard is grown in 791 thousand hectares area with annual production of 849 thousand tonnes and average productivity of 1075 kg/ha. But in Gwalior district it covers an area of 58.5 thousand hectares with annual production 75.9 thousand tonnes and average productivity of 1303 kg/ha (CLRS M.P., 2009-10). The mustard crop is infested with grassy as well as broadleaf weeds. Weeds substantially reduce the productivity and production of mustard due to competition for various inputs. A wide ranging yield reduction in the crop on account of weeds is well documented. Therefore, there is a need to create an environment that is detrimental to weeds and favourable to crop. In India, mustard weeds are recognized as one of the major negative factors of crop production. Broomrape (*Orobanche aegyptica* pers.), a holoparasitic weed has been causing heavy losses to the mustard crop in light soils of Grid region. Weed infestation during early stages reflected the crop growth and reduction in yield up to 58 percent (Prusty *et al.*, 1996). At later stages, shading caused by plant height and broad dorsoventral leaves help in suppressing weed growth (Chakaiyar and Ambasht, 1990). Many workers have stated that glyphosate at lower rates (82 g/ha) 30DAS provided excellent control of broomrape without any toxic effect on

mustard crop, but it caused some toxicity at higher rates (123 g/ha) 60DAS to the crop. Other herbicides like fluchloralin and pendimethalin did not control this weed (Kumar, 2002).

Weed Management:

A brief review related to research work done on the “Weed management in mustard (*Brassica juncea* L. Czern & Coss.)” is presented in this chapter. An attempt has been made to cite at many references as possible related to weed control measures on population and dry weight of weeds and various parameters of mustard.

Palled (1979) reported that fluchloralin as pre-plant incorporation was an effective herbicide for controlling *Orobanche*. Palled *et al.* (1985) studied on chemical weed control in tobacco and found that fluchloralin at 2 kg/ha gave significantly higher cured leaf yield than hoeing and was equal to weed free condition. Fluchloralin at the rate of 3.0 kg/ha was highly effective against *Orobanche* spp. Nemli *et al.* (1989) reported that glyphosate at 40 g/ha gave 73% control of *O. ramosa* in tobacco but caused a yield reduction. Early application of glyphosate at low rate (5 g/ha) provided 50% *O. ramosa* control with slightly increased yields. Krishnamurthy and Chari (1991) applied oils to young, unflowered broomrape shoots at 1-5 drops/shoot with a dropper. All the oils killed the parasitic shoots effectively, their optimum dosages being 1 drop/shoot for Eucalyptus, Pongamia, soybean and tobacco seed oils and 2 drops for rice bran oil. One drop of Eucalyptus and Pongamia oil, two drop of tobacco seed oil, 3 drops soybean oil and 4drops rice bran oil were taken to kill the buds of broomrape. Phytotoxicity on tobacco leaves was observed only with Eucalyptus oil. Americanos and Vouzounis (1995) studied on the control of *Orobanche* in cabbage and found that the parasite weed was effectively controlled in the field by spraying glyphosate at 60-100 g a.i./ha twice. Further, they also reported that trifluralin @ 0.9 kg a.i./ha may have a beneficial effect in reducing *Orobanche* infestation, while incorporation of organic matter into the soil did not produce any beneficial effect. Kaneria and Patel (1995) revealed that weed free condition and two hand weeding were very effective in improving (relative to weedy controls) growth attributes such as plant height and primary and secondary branches/plant at harvest, yield components such as the siliquea/plant and seed weight/plant, seed and stover yields, harvest index and the uptake of nitrogen by Indian mustard. Dhanapal G.N. (1996) assessed the efficacy of 15 herbicides for control of broomrape and results indicated that 0.5 kg/ha glyphosate 60 DAS and 0.01 kg imazaquin 30 DAS gave best weed reduction (75-80%) and increased the yield of tobacco by 43%. Dhanapal *et al.* (1998a) assessed the effect of natural oils on the control of broomrape in a naturally infested tobacco field. Natural oils which were less expensive and biodegradable differed in their ability to kill young broomrape spikes. Neem, coconut, sunflower, castor, niger and mustard oils killed the buds of orobanche within 3 to 5 days without phytotoxicity to tobacco. He further reported that glyphosate at 500 g ai/ha applied at 60 DAS and imazaquin at 10 g ai/ha applied at 30 DAS

reduced the number of above-ground broomrape spikes by 75 to 80%, respectively, and increased tobacco yield by 80 to >100% compared to the untreated plots. Imazethapyr and EPTC were found to be less effective for broomrape control, but they still led to substantially higher tobacco yields. Dhanapal *et al.* (1998b), Singh and Singh (1998) indicated that pre-plant incorporation of fluchloralin at 1.5 kg a.i./ha significantly reduced the density and biomass of weeds (*Cyperus rotundus*, *Convolvulus arvensis* and *Anagallis arvensis*) by 38.6 in first year and 46.1 per cent in second year, compared to unweeded control. Length of primary root, nodules/plant and dry weight of root were also enhanced significantly by fluchloralin application at 1.5 kg a.i./ha. Yadav *et al.* (1999a) reported that the use of pendimethalin as pre-emergence and fluchloralin as pre-planting caused significant reduction in weed population and weed dry matter resulting increased yield and its attributes and net return per hectare and per rupee investment. He further found that weed control treatments like pendimethalin 1.0 kg a.i./ha as pre-emergence, fluchloralin 1.0 kg a.i./ha pre-plant incorporation, hand weeding at 25 DAS and hand weeding at 20 and 40 DAS decreased weed population and weed dry weight and consequently increased the number of leaves per plant, plant height, number of siliquae per plant, seed weight per plant and seed yield of mustard over that of weedy check. Yadav *et al.* (1999b), Singh *et al.* (2000) observed that stale seedbed integrated with pre-plant fluchloralin 1.0 kg/ha achieved excellent control of all major weeds and recorded the highest seed yield (1682 kg/ha) with highest net return (Rs. 12694/ha). Pendimethalin was found only slightly phytotoxic at 1.0 kg/ha. Fluchloralin 1.0 kg/ha, pendimethalin 0.75 and 1.0 kg/ha and hand weeding twice at 4 and 7 weeks after sowing significantly decreased the weed dry weight and increased the plant height, primary branches per plant, number of siliquae per plant, seeds/silique, test weight and seed yield compared to weedy check. Mishra and Kurchania (2001) registered that herbicide application reduced the biomass of *Cichorium intybus*, *Medicago hispida*, *P. minor*, *Chenopodium album* and *V. sativa*, but failed to control *Cyperus rotundus*, *Anagallis arvensis* and *Convolvulus arvensis*. Hand weeding was most effective in controlling weed dry matter accumulation, followed by oxadiazon. However, 1.0 kg isoproturon/ha gave the highest seed yield, net return, and benefit:cost ratio. Mishra and Sharma (2001) revealed that in unweeded plot, sedge population decreased and broad leaved weed population was increased with advancement of cropping season, however, grass population did not show any definite trend. Pre-emergence application of alachlor with one matter throughout the crop season which was 73.5 and 73.8% less dense and 85.0 and 81.7% less heavy compared to unweeded control in 1996-97 and 1997-98, respectively, and recorded seed yield at par with weed-free. Sharma *et al.* (2001) noted that all the weed control treatments significantly reduced weed density at 60 DAS. However lowest weed density and dry matter were recorded with application of oxflurofen during both years. Sharma *et al.* (2001) further observed that pendimethalin 0.75 kg/ha was found superior to fluchloralin 1.0 kg/ha in reducing weed dry weight and improving seed yield of wheat but at par

with hand weeding at 30 DAS (Sharma *et al.* 2001), Singh *et al.* (2001) reported that weed management practices decreased the weed population and dry weight and consequently increased the weed control efficiency; yield attributes (number of siliquae per plant, seed/silique and also seed weight per plant), seed yield and mean net return over weedy check. The highest seed yield was recorded in weed free, followed by 2 manual weedings at 25 and 45 DAS which was found more effective in controlling the weeds compared with other treatments. Among the herbicides, pre-emergence application of pendimethalin 1.0 kg a.i./ha recorded higher seed yield and found best substitute of repeated manual weeding where the labour costs were too high. Anand and Vaishya (2002) showed that fluchloralin at 1000 g/ha and clodinafop at 50 g/ha produced lower weed density than the rest of the treatments. Fluchloralin at 1000 g/ha reduced weed density by 52% and weed dry weight by 48% compared to the weedy control. All weed control treatments decreased weed N uptake. Fluchloralin at 1000 g/ha and clodinafop at 50 g/ha resulted in the lowest weed N uptake. The highest seed yield was obtained in the weed free control followed by fluchloralin at 1000 g/ha and clodinafop at 50 g/ha. Covarelli (2002) reported that glyphosate (180-324 ml/ha) caused a 100 per cent reduction in broomrape but it significantly depressed tobacco yield. Kumar (2002) found that glyphosate at low rates (82 g/ha) provided excellent control of broomrape without any toxic effect on mustard crop but it caused some toxicity at higher rates (123 g/ha) to the crop. Other herbicides like fluchloralin, trifluralin and pendimethalin did not control this weed. Kurchania *et al.* (2002) it was reported by that isoproturon 1.0 kg/ha reduced the population of major weeds, namely *Phalaris minor*, *Medicago hispida*, *Melilotus alba*, and *Chenopodium album* but not scarlet pimpernel (*Anagallis arvensis*). Om Prakash (2002) further stated that hand weeding at 20 and 40 DAS, and pre-emergence application fluchloralin at 0.75 and 1.0 kg/ha applied during were most effective in the reduction of weed density and dry matter, and in the improvement of seed yield and yield components (number of primary branches and siliquae per plant, and 1000-grain weight) of mustard. Sharma and Jain (2002) indicated that herbicide application and hand weeding significantly reduced weed dry matter. The highest yield, plant height, number of branches per plant, number of seeds per silique, number of siliquae per plant, and 1000-seed weight were recorded in weed-free plots, followed by hand weeding at 30 and 45 DAS. Among the herbicides, the pre-emergence application of 1.0 kg isoproturon/ha exhibited the highest weed control efficiency. The pre-emergence application of 0.75 kg isoproturon/ha was most effective in increasing yield, net returns, cost benefit ratio, and yield attributes except plant height and number of siliquae per plant. Herbicides at higher rates were found phytotoxic. Singh and Sinsinwar (2002) observed that all the weed control treatment significantly reduced weed dry weight. Hand weeding at 25 and 50 DAS, and 0.5 kg isoproturon a.i./ha at pre-emergence were most effective in the reduction of weed dry matter production. In Indian mustard, the tallest plants with the highest number of primary branches were obtained under the weed-free plots followed by hand weeding

at 25 and 50 DAS, 0.5 kg isoproturon a.i./ha at pre-emergence+hand weeding at 25 DAS, and 1.5 kg isoproturon a.i./ha at pre-emergence. The highest grain yield was observed in weed-free plots followed by hand weeding at 25 and 50 DAS or 1.5 kg isoproturon a.i./ha at pre-emergence. The seed yield increased with the increase in the rate of isoproturon applied at pre-emergence. The highest oil yield was recorded in weed-free plots, followed by hand weeding at 25 and 50 DAS and 1.5 kg isoproturon a.i./ha at pre-emergence. Report (2003) revealed that 2 drops of soybean oils per young shoot of *Orobanche* was the most potent killer of the weed which recorded significantly higher seed yield of mustard (1452 kg/ha). Buttar and Aulakh (2003) reported that all weed treatments reduced the weed dry matter compared to unweeded plots. The weed dry matter was lowest in trifluralin + once hoeing (16.4 g/m²), followed by 1.00 kg trifluralin/ha (17.4 g/m²). These treatments recorded the highest weed control efficiency 86.5 and 85.6%, respectively. Weed dry matter was highest in the weedy control (123.4 g/m²), followed by 0.75 kg isoproturon/ha at 2 DAS (2.82 g/m²). Among all treatments, the weedy control recorded the lowest 1000-grain weight. The 1000-grain weight was highest in trifluralin + once hoeing, followed by 1.00 kg trifluralin/ha. The mean grain yield was highest with trifluralin + once hoeing (2274 kg/ha), followed by 1.00 kg trifluralin/ha (2259 kg/ha), weed-free control (2215 kg/ha) and 0.75 kg trifluralin/ha (2159 kg/ha) treatments. The grain yield was lowest in the weedy control (1562 kg/ha). Kataria *et al.* (2003) observed that weed dry weight decreased with increasing rates of trifluralin, fluchloralin and pendimethalin. The average seed yield decreased with increasing rates of fluchloralin but increased with increasing rates of trifluralin and pendimethalin which resulted to higher increments in seed yield compared to fluchloralin. Power *et al.* (2003) reported highest weed control efficiency with two hand weeding. Sharma and Singh (2003) reported that weed management practices significantly increased the yield attributes (number of siliquae per plant, number of seeds per siliqua, siliqua length, seed weight per plant and 1000-seed weight) and yield of Indian mustard over the control. Weed management practices increased the seed yield of Indian mustard by 54-80% over the weedy control (11.42 quintal/ha). Weed management practices did not exert significant influenced on oil content in seed. Pre-emergence application of pendimethalin @ 1.0 kg a.i./ha produced significantly higher seed yield of mustard which was at par with pendimethalin @ 1.5 kg a.i./ha (P.E.). The direct spray of glyphosate @ 1.0% produced minimum seed yield due to its phytotoxic effect, but recorded maximum *Orobanche* control efficiency followed by two drops of soybean oil per young shoot of *Orobanche* (Annual Report, 2004). Bazaya *et al.* (2004) observed significant reductions in weed population and dry matter with fluchloralin supplemented with hand weedings at 30 and 60 DAS, which was at par with isoproturon and pendimethalin supplemented with hand weedings at 30 and 60 DAS. Polythene mulch and weed-free treatments recorded the highest values for branches per plant, siliquae per plant, seeds per siliqua, 1000-seed weight and seed yield. Fluchloralin alone or in combination with hand weeding recorded the highest values of these

growth and yield parameters among the herbicide treatments. Fluchloralin alone or in combination with hand weeding at 30 DAS and pendimethalin in combination with hand weeding at 30 DAS recorded the highest benefit: cost ratio. Yadav (2004) revealed that the highest seed yield (17.08 q/ha) was recorded with application of isoproturon+hand weeding at 25 DAS followed by application of metribuzin+hand weeding at 25 DAS. This treatment also had the highest net return of Rs 16 743/ha and benefit: cost ratio of 4:1 over other treatments. Unchecked weeds caused 37.5% seed yield loss with the minimum net return (Rs 9312/ha) and benefit:cost ratio (3.02:1). Chauhan *et al.* (2005) registered that the application of oxyfluorfen at 0.25 kg/ha as pre-emergence, fluchloralin at 1.0 kg/ha as pre-plant application and 2 hand weedings at 25 and 40 DAS drastically reduced weed density, weed biomass and increased seed yield. The 2 hand weedings were next to weed-free in giving higher seed yield (17.55 and 17.59 q/ha during 1998 and 1999 respectively), followed by oxyfluorfen at 0.25 kg/ha as pre-emergence in both years. However, oxyfluorfen at 0.25 kg/ha was at par with fluchloralin at 1.0 kg/ha as pre-plant application and pendimethalin at 0.75 kg/ha as pre-emergence. Nepalia (2005) noted that pre-emergence application of oxadiazon was superior in increasing the growth and yield of mustard. Hand weeding, oxyfluorfen and pendimethalin also gave satisfactory results. Rathi *et al.* (2005) showed that pre-emergence application of pendimethalin at 0.5 kg/ha supplemented with one hand weeding at 30 DAS was as effective as hand weeding twice at 20 and 45 DAS in reducing the weed population and dry matter as well as in increasing seed yield (8.65 q/ha) and net return (Rs. 11764.0) over the control. However, hand weeding twice gave maximum additional yield (9.21 q/ha) and net return (Rs. 11836.0) over the weedy control. Sharma *et al.* (2005) it was reported by that the weed control treatments viz., weed free, hand weeding at 25 DAS, hand weeding at 25 and 45 DAS, pendimethalin and trifluralin at 0.75 kg and 1.00 kg a.i./ha and pendimethalin or trifluralin + one hand weeding at 45 DAS effectively reduced dry weight of weeds at harvest by 71.2-100% compared with the control. The highest seed yield (1891 kg/ha) was obtained under weed free treatment followed by pre-plant incorporation of trifluralin at 0.75 kg a.i./ha with one hand weeding 45 DAS and were at par with 2 hand weedings at 25 and 45 DAS. Among different herbicides, pre-plant incorporation of trifluralin at 0.75 kg a.i./ha was most effective in improving the growth and yield attributes viz., number of branches per plant, number of siliquae per plant and test weight with maximum seed yield and oil yield. Sinha *et al.* (2005) observed that one hand weeding at 25 DAS gave the highest secondary branches, crop growth rate, leaf area index, 1000-seed weight and seed yield while fluchloralin gave the highest siliqua per plant. One hand weeding at 25 DAS gave the lowest weed count, weed dry weight and weed growth rate, and the highest weed control efficiency. Tekale *et al.* (2005) showed that all the weed management treatment significantly decreased the dry matter production of weeds the unweeded control. The weed-free condition through timely manual weeding was most effective treatment in improving the growth and yield

attributes with the highest seed yield. It was followed by PPI application of fluchloralin at 0.6 kg/ha+one hand weeding+IC at 40 DAS. Yadav and Poonia (2005) studied that the herbicidal treatment (fluchloralin at 1.0 kg/ha in mustard and 2, 4-D at 0.5 kg/ha in wheat) in mustard-wheat-wheat-mustard rotation reduced the *Asphodelus tenuifolius* density and total weed density, and enhanced the seed yield of mustard. The use of fluchloralin alone did not control *A. tenuifolius* effectively and, thus, reduced the seed yield of mustard. Bazzaj *et al.* (2006) showed that pre-emergence applications of Ronstar effectively decreased the weed number as well as weed biomass and increased the weed control efficiency. The tallest plant, total dry matter production and partitioning into leaf, stem and reproductive organs and all other yield contributing attributes were also high in Ronstar-used plots. Setoff also decreased the weed dry weight but at the same time it decreased the plant stand and yield attributes that caused 58% yield reduction compared to the unweeded control. This indicates that Setoff is detrimental to weeds as well as mustard. Cost benefit analysis revealed that pre-emergence application of Ronstar recorded the highest gross margin and benefit cost ratio than all other the treatments. Hand weeding had the second highest gross margin but its benefit cost ratio was identical to the unweeded control treatments. Rana (2006) observed that pre-emergence application of pendimethalin @ 1 kg/ha or 1 hand weeding at 20 days after sowing effectively controlled the weeds and demonstrated a significant increase in seed yield of component crops, system seed yield and net returns over weedy check. Among the weed control treatments, 1 hand weeding at 20 days after sowing proved better in all respect than the pendimethalin and gave 18.6 and 8.3% higher seed yield of component crops. Sole Indian mustard recorded higher weed control efficiency and suppressed weed count by 12.2% and weed dry mass by 29.4% over the sole African mustard. Contrary to this, African mustard gave significantly higher seed yield (2.51 tonnes/ha) and net returns (Rs18 020/ha) that were 9.6 and 13.9% higher than the sole Indian mustard. Sarkar and Mukherjee (2006) indicated that pendimethalin had higher weed control efficiency than fluchloralin. However, pendimethalin became phytotoxic to mustard and non-selective in action at all the doses tested. Among the herbicides, fluchloralin at 1.25 kg a.i. ha⁻¹ registered the highest seed yield of mustard (10.39 q ha⁻¹) as it controlled the weeds effectively. However, black necrotic symptom at the base of the plant was observed during siliqua development stage, which disappeared at later part of crop growth. Weeds removed huge amount of plant nutrients from the soil to the tune of 165.13 kg N, 22.54 kg P and 158.84 kg K ha⁻¹. Fluchloralin at 1.00 kg a.i. ha⁻¹ was effective as pre-emergence herbicide in mustard to control weeds and to conserve the plant nutrients in soil on account of 118.08 kg N, 15.56 kg P and 104.58 kg K ha⁻¹. Singh (2009) found that the application of isoproturon (post-emergence) at 750 g/ha, trifluralin (pre-emergence) at 1200 g/ha, pendimethalin (post-emergence) at 750 g/ha and pendimethalin (pre-emergence) at 750 g/ha proved most effective in controlling weeds. Weed control efficiency ranged between 50.2 to 84.6% with different herbicide treatments.

Among different weed control measures, isoproturon (post-emergence) resulted in the highest weed control efficiency (84.6%) followed by trifluralin (pre-emergence), pendimethalin (post-emergence) and pendimethalin (pre-emergence) at 750 g/ha. Maximum seed yield (9.92 q/ha) was obtained with the application of trifluralin (pre-emergence) at 1200 g/ha which was 83.4% higher than weedy check, but it was at par with two hand weedings, pendimethalin (pre-emergence) at 750 g/ha and isoproturon (post-emergence) at 750 g/ha. Singh et al. (2009) reported that weed management practices were superior to unweeded control for yield traits. Highest values of all yield attributes were recorded with weed free treatments closely followed by isoproturon pre-emergence (1 kg a.i./ha)+interculture once at 30 DAS except in respect of seed yield/plant, where it was statistically at par to each other. Amongst all weed management treatments, weed free plots gave maximum seed yield (14.73 q/ha). However, with integrated weed management strategy isoproturon pre-emergence (1kg a.i./ha)+interculture once at 30 DAS produced significantly higher seed (14.03 q/ha) and stover yield (46.93 q/ha). Bijanzadeh *et al.* (2010) observed that herbicides reduced weed biomass compared with the weedy check. At 16 WAP (weeks after planting), application of trifluralin plus propaquizafop plus isoxaben at 1200+200+250 g a.i./ha and trifluralin plus haloxyfop-p methyl plus isoxaben at 1200+100+500 g a.i./ha provided best control (80%) of wild mustard compared to other treatments. The most effective herbicide treatments were trifluralin plus propaquizafop plus isoxaben and trifluralin plus haloxyfop-p methyl plus isoxaben regardless of the dose applied and provided maximum reduction in total weed biomass (77-89%) compared to other treatments. Results of both years showed that all herbicide treatments increased oilseed rape grain yield as compared with the weedy check but percentage of oil was not affected by various herbicide treatments. Maximum grain yield was obtained with trifluralin plus haloxyfop-p methyl plus isoxaben at 1200+100+500 g a.i./ha.], Meena and Sah (2011) found that all herbicides resulted in significantly reduced density and dry matter of weeds in Indian mustard. Weed control also reduced nutrient losses caused due to heavy weed infestation. Pre emergence application of oxadiazon 0.50 kg/ha, pendimethalin 0.75 kg/ha and pre-plant incorporation of fluchloralin 0.75 kg/ha increased seed yield by 67.3, 49.8 and 36.9% respectively over the weedy check. Mitra (2011) revealed that pendimethalin at 0.30 kg a.i./ha was found to be more effective as compared to fluchloralin at 0.70 kg a.i./ha as reflected by weed dry matter production and yield. Maximum yield (11.3 q/ha) was achieved with the application of pendimethalin at 0.30 kg a.i./ha as pre-emergence spray followed by one hand weeding at 35 DAS. The highest gross return (Rs 19,210.00/ha), net income (Rs 8,840.00/ha) and benefit-cost ratio (1.85) were also obtained with application of pendimethalin at 0.30 kg a.i./ha along with one hand weeding at 35 DAS.

Conclusion:

The literature reviewed in this paper highlighted the Identification of different weeds on mustard crop Knowledge of weeds between yield, seed yield and its components is very useful for efficient selection of desirable herbicides.

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