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Weed Management by Herbicide for Yield and Quality Parameters in Mustard (*Brassica juncea L. Czern & Coss.*)

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Abstract
A field experiment on Weed management in herbicide for growth and yield attributing characters in mustard was conducted on the RMD College of Agriculture & Research Station, Ambikapur, during the *Rabi* season of 2012-2013. Soil of the experimental field was sandy loam in texture. 12 treatments with different herbicidal combination of weed management practices were study in randomized block design and 3 times replicated. weed control treatments Pendimethalin @ 1.0kg/ha PE, Glyphosate 50gm/ha alone after emergence of Orobanche, Trifluralin @ 1.5kg/ha PPI, Glyphosate 25gm/ha alone with 1% solution NH4SO4 at 40 DAS, Neem cake at 200kg/ha in furrow and Pendimethalin at 0.5kg/ha (PE) followed by 1 hoeing at 40 DAS, Neem cake at 200kg/ha in furrow followed by Imazethapyr 30gm/ha at 20DAS, Trifluralin @ 1.5kg/ha +Neem oil 1% PPI, soybean oil 2 drops/shoot after emergence of Orobanche, Application of 25% extra dose of phosphorus and phosphorus solubilizing bacteria, Trichoderma viride 2.5kg/ha as basal application, Farmers practice-1 hoeing at 40DAS and Weedy check, The study of revealed that the plant population was uniform under various weed control treatments. Data pertaining to seed yield kg/ha. It was clear from the data that application of pendimethalin (T1) produced significantly higher seed yield over all the weed control treatment except treatment T7 and T5. Data further revealed that the treatment T3 also gave significantly higher seed yield over rest the treatment except T1, T5, and T7. Oil content (%) is analysis of variance revealed that oil content in seed did not differ significantly among different weed control treatments. However, it varied from 39.80 to 40.52 per cent. The maximum oil yield was recorded in treatment T1 which was significantly higher over weedy check. All the weed control treatments noted higher oil yield over weedy check.
Keywords: Mustard, Weed management, Herbicide Combinations

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). 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).

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. (Bhan 1992, Banga and Yadav, 2001 and Singh *et al.* 2001) even ranging from 20-70 % depending upon the type of weed flora, magnitude and duration of weed infestation (Tiwari and Kurchania 1993) Competition by weeds at initial stages is a major limiting factor to its productivity.

MATERIALS AND METHODS:

The field experiment was carried out during *Rabi* season of 2012-2013 at the Research farm, RMD College of Agriculture & Research Station, Ambikapur situated at 23018' N latitude and 83015' Elongitude and at altitude of 611 meter above mean sea level which represents the northern hills agro-climatic zone of Chhattisgarh. The soil of the experimental site was sandy loam in texture, acidic in reaction (pH 5.7), medium in organic carbon (0.56), available nitrogen (234 kg ha-1), available phosphorus (8.4 kg ha-1) and available potassium (268 kg ha-1). The experiment was carried out in randomized block design (RBD) with 3 replications. The treatments contained of nine weed management practices. The treatment comprised of Pendimethalin @ 1.0kg/ha PE, Glyphosate 50gm/ha alone after emergence of Orobanche, Trifluralin @ 1.5kg/ha PPI, Glyphosate 25gm/ha alone with 1% solution NH4SO4 at 40 DAS, Neem cake at 200kg/ha in furrow and Pendimethalin at 0.5kg/ha (PE) followed by 1 hoeing at 40 DAS, Neem cake at 200kg/ha in furrow followed by

Imazethapyr 30gm/ha at 20DAS, Trifluralin @ 1.5kg/ha +Neem oil 1% PPI, Soybean oil 2 drops / shoot after emergence of Orobanche, Application of 25% extra dose of phosphorus and phosphorus solubilizing bacteria, Trichoderma viride 2.5kg/ha as basal application, Farmers practice-1 hoeing at 40DAS and Weedy check. Data on weed population were recorded at 30, 60 days after sowing and at harvest. The observations of weed density and their dry matter were taken randomly from 0.25 m2quadrate from net plot area from each treatment. To calculate the weed control Data on weed density and dry weight was subjected to square root transformation before analysis.

RESULTS AND DISCUSSION:

Yield attributing characters

Number of siliquae per plant

Analysis of variance indicated that weed control treatment exerted significant influence on this yield attributing character. It is obvious from the data (Table 1) that number of siliquae per plant showed a positive response to most of the weed control measures. Among all the weed control treatments, T1 recorded significantly higher number of siliquae per plant, but it was at par with T7 and both are significantly over rest of the treatments. Minimum number of siliquae per plant (171.06) was registered with weedy check which was at par with T6.The treatments T8, T9, T10 and T11 also recorded statistically similar siliquae per plant and significantly higher siliquae per plant over weedy check and T6

Length of siliqua (cm)

The analysis of variance on length of siliqua at harvest is given in where it was observed that effect of treatments on length of siliquae was significant. The highest length of siliquae (3.95 cm) was recorded in T1 treatment, which was at par with T7, T5 and T3 treatment and significantly superior over rest of the treatments including weedy check. The minimum length of siliqua (2.99 cm) was recorded in T6 followed by T8, T9, T10, and T11 treatments (Table 1).

Seeds per siliqua

Weed management practices improved the number of seeds per siliquae of mustard (Table 1). Highest numbers of seeds per siliquae was recorded under T1 which was at par with T7, T5 and T3.They are significantly superior over weedy check & T6. Treatments T2, T4, T8, T9, T10 and T11 are not reached to the levels of significant but they are statistically at par to each other and significantly superior over T6.

Seed weight (g/plant)

All the weed control treatment recorded significantly higher in seed weight per plant as compared to weedy check and T9 (Table 2).Treatment T1 gave significantly higher seed weight per plant over weedy check and T9 and at par with T7 & T5. Similarly treatment T2, T3, T4, T6, T8, T10 and T11 were also statistically at par in respect of seed weight per plant. They were also superior to weedy check and T9.

1000 seed weight (g)

All the weed control treatments produced significantly higher 1000 seed weight over weedy check except T6 and T9. Application of pendimethalin registered significantly higher 1000 seed weight over weedy check, T6 & T9 but at par with T7, T5 and T3. Remaning treatment were also at par. Similresults were reported by Singh *et al.* (2001), Kataria *et al.* (2003), Sharma *et al.* (2005).

Yield parameters

Seed yield (kg/ha)

Data pertaining to seed yield kg/ha are presented in table 3 It was clear from the data that application of pendimethalin (T1) produced significantly higher seed yield over all the weed control treatment except treatment T7 and T5. Data further revealed that the treatment T3 also gave significantly higher seed yield over rest the treatment except T1, T5, and T7.

Stover yield (kg/ha)

The data on stover yield (kg/ha) presented in Table 3 Further it clear from the data (table 4.9) that maximum stover yield (kg/ha) under T1 which was significantly higher over weedy check and T6 but at par with T7 and T5. Similarly treatment T3, T2, T4, T8, T9, T10 and T11 produced significantly higher stover yield over weedy check and T6 and they were statistically at par to each others.

Quality parameters

Oil content (%)

Analysis of variance revealed that oil content in seed did not differ significantly among different weed control treatments. However, it varied from 39.80 to 40.52 per cent (Table-4).

Oil Yield (kg/ha)

The maximum oil yield was recorded in treatment T1 which was significantly higher over weedy check. All the weed control treatments noted higher oil yield over weedy check. Similar results were reported by Singh *et al.* (2001), Kataria *et al.* (2003) and Sharma *et al.* (2005).

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Table.1. Number of siliquae per plant, length of siliqua and number of seeds per siliqua of mustard as influenced by different weed control measures

S. No.	Treatment	**Siliquae/ plant**	**Length of siliqua (cm)**	**Seeds/ siliqua**
		277.53	3.95	15.16
2	T_2- Glyphosate 50gm/ha alone after emergence of Orobanche	217.23	3.68	12.93
3	T_3- Trifluralin @ 1.5kg/ha PPI	240.50	3.84	13.83
4	T_4- Glyphosate 25gm/ha alone with 1% solution NH4SO4 at 40 DAS	229.70	3.75	13.16
5	T_5- Neem cake at 200kg/ha in furrow and Pendimethalin at 0.5kg/ha (PE) followed by 1 hoeing at 40 DAS	246.76	3.86	13.90
6	T_6- Neem cake at 200kg/ha in furrow followed by Imazethapyr 30gm/ha at 20DAS	180.66	2.99	10.73
7	T_7- Trifluralin @ 1.5kg/ha +Neem oil 1% PPI	252.86	3.87	14.70
8	T_8- soybean oil 2 drops / shoot after emergence of Orobanche	195.73	3.58	12.76

9	T_9- Application of 25% extra dose of phosphorus and phosphorus solubilizing bacteria	190.86	3.56	12.73
10	T_{10}- Trichoderma viride 2.5kg/ha as basal application	201.13	3.58	12.90
11	T_{11}- Farmers practice-1 hoeing at 40DAS	207.86	3.61	12.90
12	T_{12}- Weedy check	171.06	3.46	12.10
	S.E.m±	**2.249**	**0.057**	**0.56**
	C.D. at 5%	**6.597**	**0.170**	**1.66**

Table.2. Seed and 1000 seed weight of mustard as influenced by different weed control measures

S. No.	Treatment	**Seed weight/plant (g)**	**1000 Seed weight (g)**
1	T1- Pendimethalin @ 1.0kg/ha PE	19.23	4.760
2	T_2- Glyphosate 50gm/ha alone after emergence of Orobanche	16.40	4.180
3	T_3- Trifluralin @ 1.5kg/ha PPI	17.38	4.586
4	T_4- Glyphosate 25gm/ha alone with 1% solution NH4SO4 at 40 DAS	16.73	4.296
5	T_5- Neem cake at 200kg/ha in furrow and Pendimethalin at 0.5kg/ha (PE) followed by 1 hoeing at 40 DAS	18.37	4.523
6	T_6- Neem cake at 200kg/ha in furrow followed by Imazethapyr 30gm/ha at 20DAS	16.38	3.910
7	T_7- Trifluralin @ 1.5kg/ha +Neem oil 1% PPI	18.96	4.600
8	T_8- soybean oil 2 drops / shoot after emergence of Orobanche	15.19	4.016
9	T_9- Application of 25% extra dose of phosphorus and phosphorus solubilizing bacteria	S14.65	3.956
10	T_{10}- Trichoderma viride 2.5kg/ha as basal application	15.50	4.056
11	T_{11}- Farmers practice-1 hoeing at 40DAS	16.16	4.100
12	T_{12}- Weedy check	13.99	3.820
	S.E.m±	**0.33**	**0.068**
	C.D. at 5%	**0.97**	**0.202**

Table.3. Seed and stover yield of mustard as influenced by weed control measures

S. No.	Treatment	**Seed yield (kg/ha)**	**Stover yield (kg/ha)**
1	T1- Pendimethalin @ 1.0kg/ha PE	2222.22	6527.77
2	T_2- Glyphosate 50gm/ha alone after emergence of Orobanche	1851.85	5185.18
3	T_3- Trifluralin @ 1.5kg/ha PPI	2025.46	5370.36
4	T_4- Glyphosate 25gm/ha alone with 1% solution NH4SO4 at 40 DAS	1863.42	5243.05
5	T_5- Neem cake at 200kg/ha in furrow and Pendimethalin at 0.5kg/ha (PE) followed by 1 hoeing at 40 DAS	2106.47	5995.36
6	T_6- Neem cake at 200kg/ha in furrow followed by Imazethapyr 30gm/ha at 20DAS	1635.64	4747.68
7	T_7- Trifluralin @ 1.5kg/ha +Neem oil 1% PPI	2141.20	6423.60
8	T_8- soybean oil 2 drops / shoot after emergence of Orobanche	1747.68	5126.64
9	T_9- Application of 25% extra dose of phosphorus and phosphorus solubilizing bacteria	1712.96	5115.73
10	T_{10}- Trichoderma viride 2.5kg/ha as basal application	1840.27	5138.88
11	T_{11}- Farmers practice-1 hoeing at 40DAS	1851.84	5208.33
12	T_{12}- Weedy check	1643.51	4652.77
	S.E.m±	**45.39**	**184.92**
	C.D. at 5%	**133.13**	**542.38**

Table.4. Oil content and oil yield of mustard as influenced by different weed control measures

S. No.	Treatment	**Oil content (%)**	**Oil yield (kg/ha)**
1	T1- Pendimethalin @ 1.0kg/ha PE	40.34	896.44
2	T_2- Glyphosate 50gm/ha alone after emergence of Orobanche	40.25	750.02
3	T_3- Trifluralin @ 1.5kg/ha PPI	40.52	820.71
4	T_4- Glyphosate 25gm/ha alone with 1% solution NH4SO4 at 40 DAS	39.95	739.81

5	T_5- Neem cake at 200kg/ha in furrow and Pendimethalin at 0.5kg/ha (PE) followed by 1 hoeing at 40 DAS	40.42	851.43
6	T_6- Neem cake at 200kg/ha in furrow followed by Imazethapyr 30gm/ha at 20DAS	40.01	654.41
7	T_7- Trifluralin @ 1.5kg/ha +Neem oil 1% PPI	40.20	860.76
8	T_8- soybean oil 2 drops / shoot after emergence of Orobanche	39.82	695.92
9	T_9- Application of 25% extra dose of phosphorus and phosphorus solubilizing bacteria	40.09	686.72
10	T_{10}- Trichoderma viride 2.5kg/ha as basal application	39.91	734.45
11	T_{11}- Farmers practice-1 hoeing at 40DAS	40.11	742.77
12	T_{12}- Weedy check	39.80	654.11
	S.E.m±	**0.318**	**1.57**
	C.D. at 5%	**NS**	**4.61**

