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Weed Management by Herbicide for Physiological 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. **Leaf area index d**ata pertaining to LAI at successive growth stages. The maximum LAI was recorded in treatment T1 which was significantly higher over weedy check and T6 but at par with T7, T5 and T3 at 30 and 60DAS. Further it was clear that the treatments T4, T2, T8, T9, T10 and T11 gave also higher LAI which were statistically at par to each other & significantly superior over weedy check & T6 treatment at 30 and 60DAS. Where as in 90DAS LAI was significantly higher in T1 over weedy check and T6 treatment but at par with T7, T5, T3, T4 & T2.Weedy check. **Crop growth rate (g/ day/ m2) t**he rate of increase in the biomass per unit time provided an important physiological index suggesting growth of the plant in a definite interval. The CGR was computed from the relevant data collected from field and lab work, for different stages. CGR calculated at 30-60DAS, 60-90DAS and 90-harvest of crop growth was not influenced by any weed management treatment. **Relative growth rate (g/ g/ day). t**he rate of increase in the biomass per unit time provided an important physiological index suggesting growth of the plant over the previous growth in a definite interval. The RGR was computed from the relevant data collected from field and lab work, for different stages. RGR calculated at 30-60 DAS, 60-90DAS and 90-harvest intervals of crop growth rate was not influenced by all integrated weed management treatment. **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, Physiological and Quality

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:

Physiological study

Leaf area index

Data pertaining to LAI at successive growth stages are presented in table-1. The maximum LAI was recorded in treatment T1 which was significantly higher over weedy check and T6 but at par with T7, T5 and T3 at 30 and 60DAS. Further it was clear that the treatments T4, T2, T8, T9, T10 and T11 gave also higher LAI which were statistically at par to each other & significantly superior over weedy check & T6 treatment at 30 and 60DAS. Where as in 90DAS LAI was significantly higher in T1 over weedy check and T6 treatment but at par with T7, T5, T3, T4 & T2.Weedy check. Similresults were reported by Singh *et al.* (2001), Kataria *et al.* (2003) and Sharma *et al.* (2005).

Crop growth rate (g/ day/ m2)

The rate of increase in the biomass per unit time provided an important physiological index suggesting growth of the plant in a definite interval. The CGR was computed from the relevant data collected from field and lab work, for different stages, and are presented in (Table 2). CGR

calculated at 30-60DAS, 60-90DAS and 90-harvest of crop growth was not influenced by any weed management treatment. Similresults were reported by Singh *et al.* (2001), Kataria *et al.* (2003) and Sharma *et al.* (2005).

Relative growth rate (g/ g/ day)

The rate of increase in the biomass per unit time provided an important physiological index suggesting growth of the plant over the previous growth in a definite interval. The RGR was computed from the relevant data collected from field and lab work, for different stages, and are presented in (Table-3). RGR calculated at 30-60 DAS, 60-90DAS and 90-harvest intervals of crop growth rate was not influenced by all integrated weed management treatment. Similresults were reported by Singh *et al.* (2001), Kataria *et al.* (2003) and Sharma *et al.* (2005).

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. Leaf area index of mustard at successive crop growth stages as influenced by different weed control measures

S. No.	Treatment	**30DAS**	**60DAS**	**90DAS**
1	T1- Pendimethalin @ 1.0kg/ha PE	2.893	5.060	7.263
2	T_2- Glyphosate 50gm/ha alone after emergence of Orobanche	2.446	4.050	6.443
3	T_3- Trifluralin @ 1.5kg/ha PPI	2.740	4.836	6.976
4	T_4- Glyphosate 25gm/ha alone with 1% solution NH4SO4 at 40 DAS	2.533	4.353	6.600
5	T_5- Neem cake at 200kg/ha in furrow and Pendimethalin at 0.5kg/ha (PE) followed by 1 hoeing at 40 DAS	2.830	4.953	7.130
6	T_6- Neem cake at 200kg/ha in furrow followed by Imazethapyr 30gm/ha at 20DAS	2.083	3.053	5.126
7	T_7- Trifluralin @ 1.5kg/ha +Neem oil 1% PPI	2.880	5.040	7.227
8	T_8- Soybean oil 2 drops / shoot after emergence of Orobanche	2.370	3.743	5.556
9	T_9- Application of 25% extra dose of phosphorus and phosphorus solubilizing bacteria	2.453	3.783	5.836
10	T_{10}- Trichoderma viride 2.5kg/ha as basal application	2.416	3.843	6.036
11	T_{11}- Farmers practice-1 hoeing at 40DAS	2.456	3.860	6.053
12	T_{12}- Weedy check	2.296	3.710	5.506
	S.E.m±	**0.117**	**0.148**	**0.251**
	C.D. at 5%	**0.345**	**0.436**	**0.738**

Table-2. Crop growth rate (g/day/ m2) of mustard at successive crop growth stages as influenced by different weed control measures

S. No.	Treatment	**30-60 DAS**	**60-90 DAS**	**90DAS-Harvest**
1	T1- Pendimethalin @ 1.0kg/ha PE	19.120	41.080	21.600
2	T_2- Glyphosate 50gm/ha alone after emergence of Orobanche	17.793	28.713	20.640
3	T_3- Trifluralin @ 1.5kg/ha PPI	18.520	34.480	19.880
4	T_4- Glyphosate 25gm/ha alone with 1% solution NH4SO4 at 40 DAS	18.353	30.680	19.880
5	T_5- Neem cake at 200kg/ha in furrow and Pendimethalin at 0.5kg/ha (PE) followed by 1 hoeing at 40 DAS	18.560	38.040	21.000
6	T_6- Neem cake at 200kg/ha in furrow followed by Imazethapyr 30gm/ha at 20DAS	15.633	23.410	13.240
7	T_7- Trifluralin @ 1.5kg/ha +Neem oil 1% PPI	18.560	39.040	21.320
8	T_8- Soybean oil 2 drops / shoot after emergence of Orobanche	16.040	25.280	19.320
9	T_9- Application of 25% extra dose of phosphorus and phosphorus solubilizing bacteria	16.44	29.04	15.920
10	T_{10}- Trichoderma viride 2.5kg/ha as basal application	16.84	26.04	19.680
11	T_{11}- Farmers practice-1 hoeing at 40DAS	17.24	26.84	20.200
12	T_{12}- Weedy check	15.84	24.48	11.000
	S.E.m±	**4.998**	**8.299**	**5.506**
	C.D. at 5%	**NS**	**NS**	**NS**

Table-3 Relative growth rate (g g-1 day-1) of mustard at successive crop growth stages as influenced by different weed control measures

S. No.	Treatment	**30-60 DAS**	**60-90 DAS**	**90DAS-Harvest**
1	T1- Pendimethalin @ 1.0kg/ha PE	0.0846	0.0330	0.0099
2	T_2- Glyphosate 50gm/ha alone after emergence of Orobanche	0.0783	0.0300	0.0118
3	T_3- Trifluralin @ 1.5kg/ha PPI	0.0828	0.0333	0.0103
4	T_4- Glyphosate 25gm/ha alone with 1% solution NH4SO4 at 40 DAS	0.0832	0.0310	0.0109

5	T_5- Neem cake at 200kg/ha in furrow and Pendimethalin at 0.5kg/ha (PE) followed by 1 hoeing at 40 DAS	0.0822	0.0320	0.0105
6	T_6- Neem cake at 200kg/ha in furrow followed by Imazethapyr 30gm/ha at 20DAS	0.0776	0.0340	0.0111
7	T_7- Trifluralin @ 1.5kg/ha +Neem oil 1% PPI	0.0807	0.0330	0.0101
8	T_8- Soybean oil 2 drops / shoot after emergence of Orobanche	0.0832	0.0310	0.0124
9	T_9- Application of 25% extra dose of phosphorus and phosphorus solubilizing bacteria	0.0828	0.0321	0.0096
10	T_{10}- Trichoderma viride 2.5kg/ha as basal application	0.0821	0.0295	0.0122
11	T_{11}- Farmers practice-1 hoeing at 40DAS	0.0835	0.0295	0.0122
12	T_{12}- Weedy check	0.0518	0.0295	0.0076
	S.E.m±	**0.0038**	**0.0017**	**0.0018**
	C.D. at 5%	**NS**	**NS**	**NS**

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**

