



Research Article

AN ASSESSMENT OF OROBANCHE IN MUSTARD (*Brassica juncea* L. Czern and Coss) CONTROL TECHNIQUES IN DAUSA DISTRICT OF RAJASTHAN

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Abstract- The present study was carried out at farmers' fields of Dausa district of Rajasthan during Rabi 2012-13 and Rabi 2013-14 which falls in Agroclimatic zone IIIa of Rajasthan. The soils of the experimental fields were sandy loam in texture, alkaline in reaction (pH 8.9-9.1), low in organic matter (0.12 -0.23), and nitrogen content and medium to high in potassium content. The study consists for treatments namely T₁- Control, T₂- Neem cake @ 200 kg/ha at sowing, T₃- Copper sulphate @ 2.0 kg/ha at sowing and T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation. On the basis of two year mean data regarding Orobanche density the minimum Orobanche population was recorded with T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation (2.8) followed by T₂- Neem cake @ 200 kg/ha at sowing (3.3) and T₃- Copper sulphate @ 2.0 kg/ha at sowing (4.0) which were notably low as compared to control (9.7). On the basis of two year mean data treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation, treatment T₂- Neem cake @ 200 kg/ha at sowing and T₃- Copper sulphate @ 2.0 kg/ha at sowing during recorded 39.49, 23.55 and 16.67 per cent higher seed yield as compared to control, respectively. On the basis of two year mean data the maximum net returns were recorded with treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation (38655) which are 23.20, 26.26 and 55.64 per cent higher over treatment T₃- Copper sulphate @ 2.0 kg/ha at sowing, treatment T₂- Neem cake @ 200 kg/ha at sowing and control, respectively. The treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation recorded 5.91, 18.50 and 19.03 per cent higher B:C ratio over T₃- Copper sulphate @ 2.0 kg/ha at sowing, T₂- Neem cake @ 200 kg/ha at sowing and control, respectively.

Key words- Mustard, Orobanche, Copper sulphate, Neem cake, Pyrezusulphuron

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Introduction

Brassica juncea originated from *Brassica rapa* and *Brassica nigra*. It is the third important crop in the world after soybean and oil palm. Mustard oil is used for human consumption for cooking purposes, hair oils, greases, soap making and medicines. The seed is also used as a condiment in preparation of pickles and for flavoring curries and vegetables. The oil cake contains sinigrin that causes palatability problems due to bitter in taste and glucosinolate limits its use as protein [6]. India has 6.50 mha area and 7.65 mt production with 1179 kg/ha productivity. Rajasthan is the major state of mustard cultivation with 3.05 mha and 4.61 mt production with 1571 kg/ha productivity [2]. Reductions in mustard yield due to poor weed management ranges from 10-58 % depending upon weed flora, stage, intensity and duration of crop weed competition. Among the other weeds of mustard Orobanche is a heavy feeder of assimilates in mustard. This becomes a major problem for mustard growing farmers of Dausa district of Rajasthan. Germinating seed produces a germ tube which elongates chemotropically and forms a haustorium that is attached with host plant vascular system [5]. Orobanche has been proved difficult due to its underground location, lack of photosynthesis, late appearance of orobanche shoot, closer association with host plant roots and complex mechanism of seed dispersal, germination and longevity [3, 4]. As and when Orobanche shoots become visible on and above the ground surface, most of the damage has already occurred and conventional method of weed control would often become futile. Considering the vital importance of mustard in the present oilseed scenario and huge financial burden of oilseed

import on national economy, the present study was carried out assess the Orobanche control techniques in mustard during Rabi 2012-13 and Rabi 2013-14 at farmers' fields in Dausa district of Rajasthan.

Materials and Methods

The present study was carried out at farmers' fields of Dausa district of Rajasthan during Rabi 2012-13 and Rabi 2013-14 which falls in Agroclimatic zone IIIa (Semi-arid eastern plain zone) which covers the Jaipur, Dausa, Ajmer and Tonk district of Rajasthan. The soils of the experimental fields were sandy loam in texture, alkaline in reaction (pH 8.9-9.1), low in organic matter (0.12 -0.23), and nitrogen content and medium to high in potassium content. The study consists for treatments namely T₁- Control, T₂- Neem cake @ 200 kg/ha at sowing, T₃- Copper sulphate @ 2.0 kg/ha at sowing and T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre-plant incorporation. These treatments were replicated five times at farmers' fields during both the years of the study. Observations on weed infestation were taken at each location at 100-110 days after sowing in per square meter area. The crop management practices from sowing to harvest were followed as per package of practices of the zone IIIa. In this study especial emphasis was to proper seed rate (4.0 kg/ha), balance use of fertilizers (60 kg/ha N and 30 kg/ha P₂O₅), Use of gypsum @ 250 kg/ha prior to sowing, high yielding variety (Laxmi), seed treatment with fungicides (Mencozeb 2.5 g/kg seed), insecticides (Imidacloprid 600 FS @ 9 g/kg seed), irrigation at critical stage and need based plant protection measures during both the years of the study. The cross-section data on output of mustard

crop and input used per hectare have been collected and used for further calculation of cost of cultivation, gross returns, net returns, additional cost and additional returns and benefit cost ratio. The benefit cost ratio (B:C) was calculated dividing by gross monetary returns by the total cost of cultivation.

Results And Discussion

[Table-1] revealed that the minimum Orobanche population/m² area was recorded with treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation (2.8) and T₂- Neem cake @ 200 kg/ha at sowing also (2.8) which were remarkably low as compared to T₃- Copper sulphate @ 2.0 kg/ha at sowing (3.8) and T₁- Control (9.6). during rabi 2012-13.

The similar trend was also observed during rabi 2013-14. On the basis of two year mean data regarding Orobanche density the minimum Orobanche population was recorded with T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation (2.8) followed by T₂- Neem cake @ 200 kg/ha at sowing (3.3) and T₃- Copper sulphate @ 2.0 kg/ha at sowing (4.0) which were notably low as compared to control (9.7). It is self explanatory from the table that all the treatments reduced the Orobanche population substantially as compared to control during both the years of the study. The seed yield was recorded the maximum with the treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation followed by T₂- Neem cake @ 200 kg/ha at sowing and T₃- Copper sulphate @ 2.0 kg/ha at sowing during rabi 2012-13 and the similar trend was also observed during rabi 2013-14. On the basis of two year mean data the maximum seed yield in q/ha (19.25) recorded with treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation followed by treatment T₂- Neem cake @ 200 kg/ha at sowing (17.05) and treatment T₃- Copper sulphate @ 2.0 kg/ha at sowing (16.10). On the basis of two year mean data treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation, treatment T₂- Neem cake @ 200 kg/ha at sowing and T₃- Copper sulphate @ 2.0 kg/ha at sowing during recorded 39.49, 23.55 and 16.67 per cent higher seed yield as compared to control, respectively. More or less similar findings were also recorded by (Anon, 2010) in which application of organic manure or biofertilizers & seed treatment with different chemicals like Karosine etc were found inconsistent over the years and also have limited effectiveness The maximum cost of cultivation was recorded with treatment T₂- Neem cake @ 200 kg/ha at sowing followed by treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation and T₃- Copper sulphate @ 2.0 kg/ha at sowing are substantially higher as compared to control during both the years of the study. On the basis of two year mean data the maximum cost of cultivation was recorded with treatment T₂- Neem cake @ 200 kg/ha at sowing (24162) which was 5.21, 18.29 and 22.24 per cent higher as compared to treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation, treatment T₃- Copper sulphate @ 2.0 kg/ha at sowing and control, respectively. The maximum gross returns in Rs/ha was recorded with treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation followed by treatment T₂- Neem cake @ 200 kg/ha at sowing and T₃- Copper sulphate @ 2.0 kg/ha at sowing which are much higher as compared to control during both the years of the study. The two years mean data of gross returns (Rs/ha) shows that the maximum gross returns with treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre-plant incorporation (61400) which was 12.49, 18.96 and 38.16 per cent higher over treatment T₂- Neem cake @ 200 kg/ha at sowing, treatment T₃- Copper sulphate @ 2.0 kg/ha at sowing and control, respectively. During rabi 2012-13 the highest net returns (Rs/ha) were recorded with treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre-plant incorporation followed by treatment T₂- Neem cake @ 200 kg/ha at sowing and T₃- Copper sulphate @ 2.0 kg/ha at sowing which were substantially higher over control. During Rabi 2013-14 the maximum net returns were recorded with treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre-plant incorporation followed by T₃- Copper sulphate @ 2.0 kg/ha at sowing and T₂- Neem cake @ 200 kg/ha at sowing which are much higher than control. On the basis of two year mean data the maximum net returns were recorded with treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre-plant incorporation (38655) which are 23.20, 26.26 and 55.64 per cent higher over treatment T₃- Copper sulphate @ 2.0 kg/ha at sowing, treatment T₂- Neem cake @ 200 kg/ha at sowing and control,

respectively. The B:C ratio was recorded highest treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation followed by treatment, T₃- Copper sulphate @ 2.0 kg/ha at sowing and control (T₁) during 2012-13 and the maximum B:C ratio was recorded with T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation followed by T₃- Copper sulphate @ 2.0 kg/ha at sowing, treatment, control and T₂- Neem cake @ 200 kg/ha at sowing during rabi 2013-14. On the basis of two year mean data the maximum B:C ratio was recorded with treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation (2.69) followed by treatment T₃- Copper sulphate @ 2.0 kg/ha at sowing, treatment T₂- Neem cake @ 200 kg/ha at sowing and control. The treatment T₄- Pyrazusulphuron 10 SL @ 200 gm a.i./ha as pre plant incorporation recorded 5.91, 18.50 and 19.03 per cent higher B:C ratio over T₃- Copper sulphate @ 2.0 kg/ha at sowing, T₂- Neem cake @ 200 kg/ha at sowing and control, respectively. To control the Orobanche in mustard any residual selective herbicide that can be translocated without being metabolized through a mustard plant into Orobanche attached to the mustard could prove an effective way of controlling the Orobanche in mustard.

Application of research: Farmers can use this technology to minimize the Orobanche in mustard to improve the production potential until a foolproof control or management strategy develops.

Research Category: On Farm Trial

Abbreviations: a.i. – active ingredient, mha – million hectare, mt – million tonne, N – nitrogen, P₂O₅ – Phosphorus penta oxide

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Table-1 Comparative performance of different *Orobanche* control treatments in mustard at farmers fields at Dausa district of Rajasthan

S.No.	Treatments	Orobanche population/m ² area			Seed yield (q/ha)			Cost of Cultivation (Rs/ha)			Gross returns (Rs/ha)			Net returns (Rs/ha)			B:C Ratio		
		2012-13	2013-14	Mean	2012-13	2013-14	Mean	2012-13	2013-14	Mean	2012-13	2013-14	Mean	2012-13	2013-14	Mean	2012-13	2013-14	Mean
1	T ₁ - Control	9.6	9.8	9.7	12.0	15.6	13.8	19798	19733	19766	40400	48800	44600	20602	29067	24835	2.04	2.47	2.26
2	T ₂ - Neem cake @ 200 kg/ha at sowing	2.8	3.8	3.3	16.30	17.80	17.05	24190	24133	24162	54160	55400	54780	29962	31267	30615	2.24	2.30	2.27
3	T ₃ - Copper sulphate @ 2.0 kg/ha at sowing	3.8	4.2	4.0	15.0	17.20	16.10	20458	20393	20426	50000	53600	51800	29542	33207	31375	2.44	2.63	2.54
4	T ₄ - Pyrazusulphuron 10 SL @ 200 gm a.i./ha as Pre plant incorporation	2.8	2.8	2.8	18.70	19.80	19.25	22998	22933	22966	61840	61400	61620	38842	38467	38655	2.69	2.68	2.69