# Evaluation of newly released cultivars of Indian mustard on weeds in Siwaliks region of Jammu


## ABSTRACT

**Aims:** To study the competitive ability of new varieties of Indian mustard with weeds during *rabi* season at Jammu

**Study design:** Factorial RBD Design

**Place and Duration of Study:** Oilseed Experimental Area, Research Farm, SKUAST-Jammu, Chatha, Jammu & Kashmir (UT)

**Methodology:** A field experiment was conducted at the Research farm, Chatha, Jammu during the *rabi* season of 2010-11 and 2011-12 to study the effect of various cultivars of Indian Mustard on weed density and dry weight in Indian mustard (*Brassica juncea* L.) under weedy check and weed free conditions. Among the different treatments arranged in split plot design the cultivars of Indian mustard were kept in main plots and two treatments viz. Weed free and weedy check plots were kept in sub-plots.

**Results:** The varieties NRCDR 2 and Navgold were found to be the most competitive cultivars of Indian mustard crop in suppressing the weeds at different crop growth stage at 60 days after sowing (DAS) and other subsequent crop growth stages and exhibited lowest weed Index during both the years of experimentation.

**Conclusion:** Based on two years of experimentation, it may be concluded that maximum benefit:cost ratio (B:C ratio) was observed with cultivar NRCDR 2 (1.51 and 1.03) during both years of experimentation and was found to be the most competitive cultivar of Indian mustard in suppression of weeds during the early stages of crop growth.



**Key Words:** Weeds, Weed population, Competitive cultivars, Indian mustard


## 1. INTRODUCTION

Mustard is one of the most important *rabi* oilseed crop and one of the earliest recorded spices of India and is grown on an area of 6.86 million hectares (approx.) with an average productivity of 1331 kg/ha during the year 2019-20 [1]. Globally, India ranks fourth among the major rapeseed mustard growing countries behind Canada, European Union and China respectively with a share of 19.81 per cent and 10.37 per cent in the world's total area total production of the crop respectively. Among the nine oilseed crops grown in India, it occupies about 23.91 per cent of total area and 27.19 per cent of production of the total oilseed

production in India. In Jammu and Kashmir, it is grown on more than 55000 hectares area with an average productivity of 1149 kg/ha. Weeds cause considerable reduction in the yield of Indian mustard which ranges 30-45 per cent and more and weed management during the critical crop weed competition period results in minimum economic losses [2]. Under irrigated conditions Indian mustard is infested predominantly with broad leaved as well as grassy weeds. The critical period of crop weed competition in Indian mustard is between 30-45 days after sowing (DAS) [3]. Different weed management strategies viz. herbicides, cultural and biological etc. are used to manage the weeds below economic threshold [4]. Recently some mustard genotypes have been found to have vigorous growth characteristics like quick germination, leaf area index during the initial crop growth period up to 45 days after sowing thereby suppressing the weeds which benefits the crop during the initial days of crop-weed competition period. Therefore, the evaluation of recently developed competitive cultivars of Indian mustard for managing weeds holds promise. Consequently, the present study was undertaken to study the competitive behaviour of newly released varieties of Indian mustard against weeds under Jammu conditions.

## 2. MATERIALS AND METHODS

An experiment to study the effect of different cultivars of Indian Mustard on weeds population and weed dry weight was conducted during the *rabi* season of 2010-11 and 2011-12 at the Research Farm, Chatha of the Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, Jammu and Kashmir (UT), India. The experimental field was situated at $32^0$ 40' N latitude and $74^0$ 58' E longitude with an altitude of 332 m above mean sea level. The soil of the experimental field was low in organic carbon (0.37%) and nitrogen (208 kg/ha), medium in available phosphorus (15.3 kg/ha) and potassium (128 kg/ha) and slightly alkaline in pH (7.1). The soil analysis was done using standard methods [2, 6,7,8,12]. The Indian Mustard crop was sown in the second fortnight of October in rows 30 cm apart and 10$\pm$15 cm plant to plant distance using 5 kg seeds/ha during both the years of experimentation. The recommended dose of 60:30:15:20 kg/ha of N:$P_2O_5$:$K_2O$:S was uniformly applied to all the treatments using Urea, Diammonium Phosphate (DAP), Muriate of Potash (MOP) and Gypsum as fertilizers. The full dose of DAP, MOP and Gypsum besides half a dose of Urea were applied as basal dose at the time of

sowing. The balance amount of Urea was given as split dose at 35 days after sowing of the crop during both years of experimentation. The crop was raised as per standard package and practices and was harvested during the last week of March during both the years of experimentation. The experiment consisted of twelve treatments which were laid down in factorial randomized block design (FRBD) with 3 replications and comprised of two factors namely six Indian mustard (*Brassica juncea* L.) varieties (kranti, RL 1359, Navgold, NRCDR 2, CS-56/NRCDR 601 and RSPR 01.) as Factor A and two levels of weed management as Factor B (weed free and weedy check). In the weed free plots, 3 hand weeding at 25-30 days intervals were done to keep the field weed free throughout the crop season. The variety CS-56 was taken in an experiment in the first year of experimentation and was substituted by NRCDR 601 during the second year of experimentation in the experiment in view of its better growth characteristics during the early phases of crop growth than the CS 56 variety in comparison. For economic evaluation the cost of cultivation, gross returns based on minimum support price of Indian mustard were computed by using standard formulae. The net returns were computing by deducting the total cost of cultivation from the gross returns as per treatments. The Benefit : Cost ratio was calculated by dividing the net returns with the cost of cultivation as per the treatments. The data was analyzed and presented using standard formulas [9]. The standard package and practices were followed for raising the crop during the entire period of experimentation.

## 3. RESULTS AND DISCUSSION

The major broad leaved weeds present in the experimental field were *Trachyspermum sp.*, *Anagallis arvensis*, *Euphorbia helioscopia*, *Medicago denticulata*, *Vicia sativa*, *Chenopodium album*, *Rumex maritimus*, *Fumaria parviflora and Cirsium arvense*. *Among the* grassy weeds mjor weeds present in the experiment were *Poa annua*, *Phalaris minor* and *Avena ludoviciana* during both years of study. The maximum weed population (108.8 and 136.76) and dry weed biomass (82.51 and 113.31) was recorded in weedy check (control) plots, whereas minimum weed population (10 and 20.76) and weed dry weight (5.05 and 11.98) was recorded in weed free plots during both years of experimentation respectively.

Among the different Indian mustard cultivars NRCDR 2 (1398 kg/ha) though at par with Novgold (1316 kg/ha) resulted in a significant increase in the seed yield and other yield attributes viz. Siliquae per plant, Seeds per Siliquae, 1000- seed weight and of Indian mustard than other cultivars in comparison during the first year of experiment. However, during the second year of experimentation, Indian mustard cultivar NRCDR 601 (1298 kg/ha) proved to be equally competitive along with cultivars NRCDR 2 (1368 kg/ha) and Navgold (1274 kg/ha) in increasing the seed yield of Indian mustard than other cultivars in comparison [Table 2]. However, the lowest weed density and weed dry weight was recorded in Indian Mustard cultivars NRCDR 2 and Novgold during the first year of experimentation [Table 1]. However, variety NRCDR 601 proved to be equally effective in suppressing the grassy and broad leaved weeds during the second year of experimentation (Table 1). This suppression of weeds during the initial period of crop growth may have been resulted due to better utilization of nutrients, moisture, space and light thereby resulting in higher LAI of the said genotypes thereby increasing their ability over other genotypes in comparison [3, 4]. Also, the lowest weed Index was recorded with cultivar NRCDR 2 (4.77 and 7.88 percent) during both the years of experimentation respectively. The maximum net returns (Rs. 15912 and Rs. 12893) and benefit:cost ratio (1.51 and 1.03) was recorded in plots with NRCDR 2 variety during both the years of experimentation respectively [Table 2]. However, the interaction effect between the factor was found to be non significant during both the years of experimentation.

## CONCLUSION

Based on the average of two years of experimentation conducted in 2010-11 and 2011-12 on the competitive behavior of Indian mustard varieties against weeds vis-à-vis weed smothering potential of various newly developed genotypes, it was concluded that new high yielding variety NRCDR 2 gave highest seed yield of mustard and was found to be most competitive cultivars of Indian mustard for suppression of weeds during the critical stages of crop weed completion period and subsequent stages of Indian mustard crop in the Jammu region.

### Authors Contribution

This work has been done by author RB and BRB in collaboration. Authors BRB and RB designed the study, MG managed the analysis of data and RG recorded and tabulated the data, author RB wrote the research paper in original draft. And author MG, BRB and RG helped in finalization of the final draft of the research paper.

### Competing Interests

We declare, no competing interest from all the authors with respect to the manuscript

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**Table 1. Effect of different cultivars on weed count and weed dry weight in Indian mustard at 60 days after sowing of Indian mustard**

| Treatments | Weed population (no./$m^2$) | | | | | | Weed dry weight (g/$m^2$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2010-11 | | | 2011-12 | | | 2010-11 | | | 2011-12 | | |
| | Broad leaved | Grasses | Total | Broad Leaved | Grasses | Total | Broad Leaved | Grasses | Total | Broad Leaved | Grasses | Total |
| **Varieties** | | | | | | | | | | | | |
| Kranti | 33.64 ( 5.80) | 9.67 ( 3.11) | 43.31 ( 6.58) | 42.33 (6.51) | 38.00 (6.16) | 80.33 (8.96) | 23.61 ( 4.86) | 7.40 ( 2.72) | 31.01 (5.57) | 39.77 (6.31) | 23.98 (4.90) | 63.75 (7.98) |
| RL 1359 | 35.88 ( 5.99) | 13.69 ( 3.70) | 49.57 (7.05) | 42.67 (6.53) | 40.00 (6.32) | 82.67 (9.09) | 24.90 ( 4.99) | 8.29 ( 2.88) | 33.19 (5.76) | 40.19 (6.34) | 24.26 (4.93) | 64.45 (8.03) |
| NRCDR 2 | 29.60 (5.44) | 9.12 ( 3.02) | 38.72 (6.22) | 36.67 (6.06) | 33.33 (5.77) | 70.0 (8.37) | 22.84 ( 4.78) | 6.96 ( 2.64) | 29.8 (5.46) | 36.48 (6.04) | 21.67 (4.66) | 58.15 (7.63) |
| Novgold | 33.99 ( 5.83) | 11.56 ( 3.40) | 45.55 (6.75) | 39.33 (6.27) | 36.67 (6.06) | 76.0 (8.72) | 23.42 (4.84) | 7.95 ( 2.82) | 31.37 (5.60) | 39.85 (5.69) | 22.55 (4.75) | 62.40 (10.08) |
| CS 56/ NRCDR 601 | 32.72 ( 5.72) | 12.74 ( 3.57) | 45.46 (6.64) | 40.33 (6.35) | 35.33 (5.94) | 75.66 (8.69) | 24.20 ( 4.92) | 8.53 ( 2.92) | 32.73 (5.72) | 37.50 (6.31) | 22.09 (4.70) | 59.59 (7.89) |
| RSPR 01 | 39.56 ( 6.29) | 14.51 ( 3.81) | 54.07 (7.35) | 43.33 (6.58) | 41.33 (6.43) | 84.66 (9.20) | 24.41 ( 4.94) | 8.64 ( 2.94) | 33.05 (5.75) | 40.92 (6.40) | 24.87 (4.99) | 65.79 (8.11) |
| CD (p=0.05) | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| **Weed Management** | | | | | | | | | | | | |
| Weedy check | 85.56 ( 9.25) | 23.23 ( 4.82) | 108.80 (10.43) | 72.95 (8.54) | 63.81 (7.99) | 136.76 (11.69) | 64.96 (8.06) | 17.55 ( 4.19) | 82.51 (9.08) | 71.04 (8.43) | 42.27 (6.50) | 113.31 (10.64) |
| Weed free | 5.80 ( 2.41) | 4.20 ( 2.05) | 10.00 (3.16) | 8.95 (2.99) | 11.81 (3.44) | 20.76 (4.56) | 2.92 (1.71) | 2.13 (1.46) | 5.05 (2.25) | 7.33 (2.71) | 4.65 (2.16) | 11.98 (3.46) |
| CD (p=0.05) | 0.32 | 0.35 | 0.68 | 0.29 | 0.36 | 0.65 | 0.12 | 0.06 | 0.09 | 0.20 | 0.23 | 0.22 |

*** The data in parenthesis has been subjected to square root transformation for ensuring homogeneity of variance as the weeds data was not normally distributed in the field**

**Table 2. Effect of different cultivars on yield, yield attributes, net returns and economics of Indian mustard**

| Treatments | Seed yield (q/ha) | | Siliquae/plant | | Seed/Siliquae | | 1000-seed weight | | Net Returns (Rs./ ha) | | B:C ratio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2010-11 | 2011-12 | 2010-11 | 2011-12 | 2010-11 | 2011-12 | 2010-11 | 2011-12 | 2010-11 | 2011-12 | 2010-11 | 2011-12 |
| **Varieties** | | | | | | | | | | | | |
| Kranti | 12.84 | 12.52 | 397.16 | 424.83 | 15.16 | 12.83 | 3.70 | 3.59 | 13283 | 10741 | 1.26 | 0.85 |
| RL 1359 | 12.66 | 12.09 | 376.13 | 409.17 | 15.10 | 12.53 | 3.63 | 3.55 | 12954 | 9936 | 1.23 | 0.78 |
| NRCDR 2 | 13.98 | 13.68 | 414.53 | 443.33 | 15.90 | 14.93 | 3.8 | 3.79 | 15912 | 12893 | 1.51 | 1.03 |
| Novgold | 13.18 | 12.74 | 412 | 433.67 | 15.36 | 14.33 | 3.74 | 3.68 | 13907 | 11148 | 1.32 | 0.88 |
| CS 56/NRCDR 601 | 12.97 | 12.97 | 408.06 | 439.33 | 16.20 | 14.67 | 3.82 | 3.77 | 13500 | 11579 | 1.28 | 0.91 |
| RSPR 01 | 11.99 | 11.74 | 365.43 | 397.33 | 14.26 | 12.07 | 3.46 | 3.38 | 11705 | 9289 | 1.11 | 0.73 |
| CD (p=0.05) | 0.82 | 1.09 | 26.64 | 11.78 | NS | 0.83 | 0.16 | 0.13 | - | - | - | - |
| **Weed Management** | | | | | | | | | | | | |
| Weedy check | 11.17 | 10.18 | 346.78 | 389.24 | 14.70 | 12.00 | 3.39 | 3.42 | 11436 | 7668 | 1.20 | 0.69 |
| Weed free | 14.68 | 14.85 | 444.83 | 453.62 | 15.96 | 14.82 | 3.76 | 3.79 | 15652 | 13973 | 1.36 | 1.01 |
| CD (p=0.05) | NS | 0.58 | 15.38 | 6.30 | 1.0 | 0.45 | 0.09 | 0.07 | - | - | - | - |