Himachal Journal of Agricultural Research
Volume 51, Issue 2, December 2025; pp. 270–275; DOI: 10.18311/HJAR/2025/53860
INFORMATICS JOURNALS
Short communication

Comparative Performance of *Canola* Hybrid of *Brassica napus* L. at Varying Fertility Levels in Himachal Pradesh

Bhupinder Singh Mankotia*, Anshul Kumar and Anjali Rawat

Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Shivalik Agriculture Research and Extension Centre, Kangra – 176001, Himachal Pradesh, India; bsmankotia@gmail.com

Abstract

A field experiment was conducted at Shivalik Agricultural Research and Extension Centre (SAREC), Kangra, to test the hybrid genotype of *Canola* (*Brassica napus* L.) Glutathione (GSH 2155) in comparison to four checks at three fertility levels, *viz*. 100, 125 and 150% Recommended Dose of Fertilisers (RDF, 120:60:40 kg NPK/ha. Primarily due to more siliquae per plant (336), seeds per siliqua (26.4) as well as test weight (3.74 g) variation, 'GSH 2155' produced significantly higher seed yield of 2958 kg/ha as compared to AKMS 8141 by 16.3%, GSC 6 by 31.9 %, GSL 1 by 40.2% and Kranti by 81.0%. Thus, hybrid GSH 2155 accrued higher gross (Rs. 1,68,013/ha), net returns (Rs. 1,30,371/ha) and B: C ratio (3.6). Interaction effect of genotypes and fertility levels revealed that 'GSH 2155' produced significantly higher seed yield of 3205 kg/ha and oil yield (1232 kg/ha) at 125%RDF (being at par with 150% RDF), thus recorded high net returns of Rs. 1,43,448/ha.

Keywords: Canola, Fertility levels, Genotype, Oil yield, Productivity, Profitability

India is the 4th largest producer of oilseeds, accounting for ~20% of the global area and ~10% of the global production (Choudhary *et al*. 2015). Currently, oilseeds occupy about 25 million ha (m ha) of land, producing 32 million tons (mt) of oilseeds. As per an estimate, India imported around 15.96 mt of edible oils mainly from Indonesia, Malaysia for palm oil and from Brazil, Argentina, Russia and Ukraine for soybean and sunflower oil, valuing Rs. 1,31,967 crores in the oil year 2023-24 (November to October).

Among various oilseed crops, the rapeseed-mustard occupies a prominent position in terms of total area and production in our country. Rapeseed-mustard is also the most important group among the oilseed crops in Himachal Pradesh, grown on an area of 8.61 thousand ha with the production of 4.9 thousand tonnes and a productivity level of 570 kg/ha (Anonymous 2019-20). The efforts at the national level are being accelerated as the demand for edible oil is increasing day by day, besides the demands from industrial users. To overcome the huge gap between production and consumption, which is being met by huge imports (50-60 %), the exploration of new genotypes with higher productivity is one of the viable options. Hence, the development and adoption of new High-Yielding Varieties (HYVs) can improve India's oilseed production (Thakur *et al*. 2012). Further, the rapeseed-mustard yield can be increased to 2–2.5 t/ha by adopting the improved agronomic practices (Parmar *et al*. 2007; Choudhary *et al*. 2015; Chandel *et al*. 2023). Fertiliser management has an important role to play in increasing the productivity of rapeseed-mustard, which can be realised by providing plant nutrients in a balanced amount along with a suitable agronomic package to the crop (Jakhar *et al*. 2018). The plant growth rests on the availability of nutrients in the soil that can be controlled by the proper application of

*Author for correspondence

Manuscript received: 24.06.2025; Accepted: 02.08.2025

fertilisers (Chandel *et al*. 2023). The disproportionate use of fertilisers does not always contribute towards high yield, but excessive use may, unfortunately, result in the reduction of nutrient use efficiency and cause a sequence of economic and environmental problems (Chandel *et al*. 2022). Suitable application of plant nutrients holds a significant role for improving the yield and maintaining soil health (Sharma and Sharma 2016; Sharma *et al*. 2016). In that direction, a hybrid canola genotype GSH 2155 developed by Punjab Agricultural University, Ludhiana, was promoted for testing in advanced agronomic trials under the All India Coordinated Research Project on Rapeseed-Mustard. As the rapeseed-mustard crops are very responsive to nutrients (Thakur *et al*. 2005; Jakhar *et al*. 2018), the present investigation was carried out in an ample supply of the fertiliser nutrients.

A field experiment was conducted during the *Rabi* season of 2023-24 at the Research Farm of CSK Himachal Pradesh Krishi Vishvavidyalaya- Shivalik Agricultural Research and Extension Centre, Kangra (latitude 32° 09′N; longitude 76°22′E; altitude 700m) to study the performance of one test genotype of *Canola* hybrid 'GSH 2155' and three checks, *viz*. GSL-1 (National Check), AKMS 8141 (Local Check), GSC-6 (Quality check) and Kranti (National Check) in the main plots and three fertility levels, *viz*. 100, 125 and 150% recommended dose of fertilisers (RDF, 120:60:40 kg NPK/ha) in sub-plots of split plot design replicated thrice. The soil of the experimental site was acidic in reaction (pH 6.1), silty-clay loam in texture, medium in available-nitrogen (336.8 kg/ha), phosphorus (15.7 kg/ha) and potassium (214.6 kg/ha). The crop was sown on 19th October, 2023, in lines 30 cm apart using 6kg seed/ha in 6.5×1.8m plots. Full dose of phosphorus through SSP (16% P_2O_5), potash through MOP (K_2O 60%) and half nitrogen (N) through Urea (46% N) was applied as a basal dose, and the remaining half-N was top dressed at 55 Days After Sowing (DAS). Pendimethalin @ 1.0 kg/ha was applied as pre-emergence to control the weeds, followed by hoeing at 25 DAS. Thinning/gap filling was done to maintain a plant-to-plant distance of 15-20 cm. The cypermethrin @ 500 ml/ha was sprayed as a plant protection measure against sawfly at the vegetative stage. Three irrigations on the vegetative and flowering stages were given to avoid moisture stress. Mean monthly maximum temperature ranged from 12.8 to 31.2°C and minimum 2.0 to 18.1°C, which were quite favourable for the growth and development of the crop. Crop received 298.1mm of rainfall during the cropping season. Data on plant height and population count, siliquae/plant, seeds/siliqua were recorded at the time of harvest of the crop at pod maturation stage (Rana *et al*. 2014). The crop was allowed to sun-dry after harvest and weighed for biological yield and to compute stover yield and harvest index using standard procedures (Rana *et al*. 2014). The seeds were counted manually for test-weight. The oil content in seeds was determined by using Soxhlet's extraction method (A.O.A.C. 193). Economic analysis was carried out using prevailing costs of inputs and the Minimum Support Price (MSP) of sarson seed (Rs. 56.3/kg).

Significant variation among genotypes in terms of growth, development and productivity was recorded (Tables 1 and 2). Growth in terms of plant height, secondary branches per plant and development in terms of days taken to 50% flowering significantly varied among the tested genotypes (Table 1). New genotype 'GSH 2155' attained a plant height of 183.4cm, being at par with local check AKMS 8141 and significantly less than the national check GSL 1(189.9cm), whereas significantly taller than mustard genotype Kranti by 23 cm and quality check GSC 6 by 51.7cm. The number of primary branches in GSH 2155 was 5.6, as in GSL 1(NC). Number of secondary branches/plant in new genotype (11.7) was statistically at par with GSL-1, GSC 6 and Kranti, whereas significantly more than local check AKMS 8141. However, the days taken to 50% flowering in GSH 2155 (97 days) were at par with AKMS 8141 but significantly more than other checks by 3 to 7 days. The plant stand recorded at harvest did not exhibit significant variation.

Main effects of fertility levels revealed that plant height showed an increase with an increase in fertility level (by 3.2cm as RDF increased from 100 to 125%); however, not statistically significant. Whereas primary and secondary branches improved significantly as the fertility level increased from 100 to 125% RDF, thereby revealing that better crop nutrition improved the branching (Choudhary *et al*. 2003; Paul *et al*. 2011). Days taken to 50% flowering and plant stand were not varied significantly; however, the crop took 94 days for flowering at 100% RDF and 93 days at a higher dose.

Table 1. Effect of genotypes and fertility levels on plant height, branches and plant stand

Treatments	Plant height (cm)	Primary branches/ plant (No.)	Secondary branches/plant (No.)	Days to 50% flowering (No.)	Plant population (×1000/ha)
Genotypes					
GSH-2155 GSL-1 (NC*)	183.4 189.9	5.6 5.6	11.7 10.8	97 94	18.1 17.6
AKMS-8141 (LC)	182.2	5.4	9.8	96	18.8
GSC-6 (QC)	131.7	4.9	10.8	92	18.0
Kranti (NC)	176.3	5.0	11.2	90	17.2
CD (*P*=0.05)	6.2	NS	1.2	1.3	NS
Fertility levels					
100% RDF	170.3	5.0	9.5	94	17.7
125% RDF	173.5	5.6	11.7	93	18.1
150% RDF	174.4	5.4	11.4	93	18.0
CD (*P*=0.05)	NS	0.5	1.0	NS	NS

**NC: National check, LC: Local check, QC: Quality check*

Table 2. Effect of genotypes and fertility levels on yield attributes and seed yield

Treatments	Siliquae/plant (No.)	Seeds/siliqua (No.)	Test-weight (g)	Seed yield (kg/ha)	Stover yield (kg/ha)	Harvest index (%)
Genotypes						
GSH-2155 GSL-1 (NC)	336 314	26.4 26.6	3.74 3.76	2958 2109	7607 6786	28.3 24.0
AKMS-8141(LR)	304	26.6	3.62	2543	7390	25.6
GSC-6 (QC)	224	24.6	3.75	2243	6249	26.6
Kranti (NC)	212	14.7	4.62	1634	4834	25.6
CD (*P*=0.05)	20.6	1.0	0.40	151.1	833	NS
Fertility levels						
100% RDF	266	23.9	3.97	2131	6315.2	25.5
125% RDF	287	23.7	3.88	2414	6655.4	26.7
150% RDF	282	23.7	3.84	2347	6749.7	25.8
CD (*P*=0.05)	14.8	NS	NS	107.6	NS	NS

Significant variation in yield attributes, seed and stover yield was observed among the genotypes (Table 2). Test genotype hybrid GSH 2155 recoded significantly more siliquae per plant (336) than national check 'GSL 1 (314), local check AKMS 8141 (304), quality check GSC-6 (224) and mustard cultivar Kranti (212). Test genotype hybrid GSH 2155 (26.4) recoded significantly more seeds per siliqua than quality check GSC 6 (24.6) and mustard genotype Kranti (14.7); however, at par with national check GSL 1 (26.6) and local check AKMS 8141(26.6). Mustard (*Brassica juncea*), being bold-seeded than *Brassica napus* genotypes, recorded significantly more test weight (Kranti 4.62g), whereas it ranged from AKMS 8141(3.62g) to GSL 1 (3.76g) in other (*B. napus*) genotypes. Test genotype hybrid GSH 2155 recorded a

test weight of 3.74g. Primarily due to more siliquae per plant, seeds per siliqua as well as test weight variation, GSH 2155 hybrid produced significantly higher seed yield of 2958 kg/ha as compared to local check AKMS 8141 by 16.3% (416 kg/ha), GSC 6(QC) by 31.9 % (715 kg/ha), GSL 1(NC) by 40.2% (849 kg/ha) and over mustard genotype Kranti(NC) by 81.0% (1324 kg/ha). Similarly, at Ludhiana new genotype GSH 2155 produced significantly more seed yield of 3565 kg/ha as compared to other checks (Anonymous 2024). Harvest index in the new genotype was 28.3 per cent, whereas in other genotypes it varied from 24 to 26.6 per cent, though variation was not statistically significant. Stover yield was more in the new genotype, being at par with AKMS 8141. Mean effects revealed that an increase in fertility level from 100 to 125% RDF significantly increased the siliquae per plant from 266 to 287, and thus recorded significantly more seed yield of 2414 kg/ha, which decreased to 2347 kg/ha at 150%RDF. Similar results were also reported by Paul *et al.* (2011) and Thakur *et al.* (2012) in mid-hill conditions of the north-western Himalayas. New genotype 'GSH 2155' had 41.2% seed oil content, which was more than other checks, having 36.7 to 40.5 % (Table 3). The oil content per cent did not vary significantly due to an increase in fertility level. An increase in fertility level from 100 to 125 % increased oil productivity significantly from 839 to 967 kg/ha. The extensive root system development with the balanced fertilisation, along with organic manure in an adequate amount, might have assisted in the efficient absorption and utilisation of other nutrients that resulted in better performance (Sharma *et al.* 2016; 2018). Mean effects revealed that primarily due to higher seed yield, test genotype recorded significantly higher oil yield of 1220 kg/ha followed by local check AKMS 8141 (1030 kg/ha), quality check GSC 6 (901 kg/ha), national check (GSL 1 (827 kg/ha) whereas lowest oil yield of 601 kg/ha was recorded by Kranti. Remunerations in terms of gross (Rs. 1,68,013/ha) and net returns (Rs. 1,30,371/ha), and B: C ratio (3.46) were also higher in the case of new genotype 'GSH 2155 followed by AKMS 8141 (143703,106061 & 2.81 respectively), quality check GSC 6, national check GSL 1 and Kranti. Mean effects of fertility levels that 125%RDF recorded more gross (Rs 1,36,415/ha), net (Rs 1,30,371/ha) and B: C ratio of 2.62 over 100% RDF.

The interaction effect of genotypes and fertility levels varied the seed and oil productivity as well as profitability significantly (Table 4). GSH 2155, GSL 1 and GSC 6 recorded a significant increase in seed yield as the fertility level increased from 100 to 125%RDF. Hybrid GSH 2155 at 100%RDF produced seed yield at par with GSC 6, given 125% RDF and with local check AKMS 8141 given 125 or 150% RDF. New genotype hybrid 'GSH 2155' produced significantly higher seed of 3205 kg/ha and oil yield (1232 kg/ha) at 125%RDF (being at par with 150% RDF-3018 kg seed/ha), than all other combinations of genotypes and fertility levels, thus recorded more net returns of Rs. 1,43,448/ha.

Table 3. Effect of genotypes and fertility levels on oil content, oil yield and economics

Treatments	Oil content (%)	Oil yield (kg/ha)	Gross returns (Rs./ha)	Net returns (Rs./ha)	B: C ratio
Genotypes					
GSH-2155	41.2	1220	168013	130371	3.46
GSL-1(NC)	39.2	827	119165	81523	2.16
AKMS-8141(LR)	40.5	1030	143703	106061	2.81
GSC-6(QC)	40.2	901	125622	87980	2.33
Kranti(NC)	36.7	601	92311	54367	1.44
CD (*P*=0.05)	0.4	57.0	8459	8479	0.22
Fertility levels					
100% RDF	39.1	839	120943	84448	2.32
125% RDF	39.7	967	136415	98733	2.62
150% RDF	39.9	941	131931	92961	2.38
CD (*P*=0.05)	0.3	42.2	5317	5307	0.14

Table 4. Interaction effect of genotypes and fertility levels on seed yield, oil yield and net returns

Entry / Fertility level	GSH-2155	GSL-1(NC*)	AKMS-8141 (LC)	GSC-6(QC)	Kranti (NC)	Mean
Seed yield (kg/ha)						
100% RDF	2650	1992	2382	2067	1564	2131
125% RDF	3205	2270	2527	2479	1591	2414
150% RDF	3018	2066	2721	2185	1746	2347
Mean	2958	2109	2543	2243	1634	
CD (*P*=0.05)	Entry (E)=151.1, Fertility level(F)=107.6, F at the same level of E= 224, E at the same or different level of F=240					
Oil yield (kg/ha)						
100% RDF	1091	767	948	834	556	839
125% RDF	1329	900	1029	990	585	967
150% RDF	1239	813	1112	880	661	941
Mean	1220	827	1030	901	601	
CD (*P*=0.05)	Entry (E)=57.0, Fertility level(F)=42.2, F at the same level of E =94.5, E at the same or different level of F = 95.8					
Net returns (Rs/ha)						
100% RDF	116108	76220	98289	80470	51152	84448
125% RDF	143448	90602	105139	102401	52275	98773
150% RDF	131558	77748	114755	81071	59673	92961
Mean	130371	81523	106061	87980	54367	
CD (*P*=0.05)	Entry (E)=8479, Fertility level(F)=5308, F at the same level of E =11868, E at the same or different level of F =12861					

**NC: National check, LC: Local check, QC: Quality check*

CONCLUSION

It is concluded that the new canola *gobhi sarson* hybrid 'GSH 2155' is more productive (3205 kg seed/ha) and profitable for growing in Himachal Pradesh and should be given 125% RDF. Being a quality genotype, it is also good for health. Hence, its cultivation may be augmented to raise the economy and health of hill farmers.

Conflict of interest: The authors declare no competing interests.

REFERENCES

Anonymous 2019-20. Directorate of Economics and Statistics (DAC and FW), Department of Agriculture and Cooperation, GOI, New Delhi.

Anonymous 2024. Annual Progress Report 2024. AICRP on Rapeseed Mustard, pp. CP 215. Anonymous

AOAC 1970. Official methods of analysis. Association of Official Agricultural Chemists, Washington, D.C. Edn **3(13):** 185.

Chandel A, Sharma A, Sharma P, Rana SS, Rana RS and Shilpa 2023. Seed yield, nutrient absorption and soil health as influenced by sowing time, fertility and genotypes of garden pea (*Pisum sativum* L.). Horticultural Science **50(2):** 142-151. https://doi.org/10.17221/138/2022-HORTSCI

Chandel A, Sharma A, Sharma P, Manuja S, Rana RS and Rana SS 2022. Seeding time, fertility level and genotype influence on productivity, quality and profitability of garden pea (*Pisum sativum*). Indian Journal of Agronomy, **67(1):** 30-37. https://doi.org/10.59797/ija.v67i1.81

Choudhary AK, Badiyala D and Negi PS 2003. Comparative performance of Brassica species to varying fertility levels under mid-hill conditions of Himachal Pradesh. Journal of Oilseeds Research **19(1):** 123-124.

Choudhary AK, Negi PS, Badiyala D and Awasthi CP 2001. Effect of fertility levels on quality of Brassica species under mid-hill conditions of Himachal Pradesh. Indian Journal of Agricultural Biochemistry **14(1):** 51-53.

Choudhary AK, Rana DS, Bana RS, Pooniya V, Dass A, Kaur R and Rana KS 2015. Agronomy of oilseed and pulse crops. [ISBN: 978-93-83168-21-7]. ICAR-IARI, New Delhi; and ICAR, DARE, New Delhi, India. pp. 218 + viii.

Jakhar P, Rana KS, Dass A, Choudhary AK, Kumar P, Meena MC and Choudhary M 2018. Tillage and residue retention effect on crop and water productivity of Indian mustard (*Brassica juncea*) under rainfed conditions. Indian Journal of Agricultural Sciences **88(1):** 47-53. https://doi.org/10.56093/ijas.v88i1.79569

Parmar DK, Sharma A, Chadha S, Sharma V, Vermani A, Mishra A, Gautam G and Kumar V 2007. Increasing potato productivity and profitability through integrated plant nutrient system in the north-western Himalayas. Potato J **34(3-4):** 209-215.

Paul J, Suri VK, Sandal SK and Choudhary AK 2011. Evaluation of targeted yield precision model for Soybean and Toria crops on farmers' fields under sub-humid sub-tropical north-western Himalayas. Communications in Soil Science and Plant Analysis **42(20):** 2452-2460. https://doi.org/10.1080/00103624.2011.609254

Rana KS, Choudhary AK, Sepat S, Bana RS and Dass A 2014. Methodological and Analytical Agronomy. [ISBN: 978-93-83168-07-1]. Post Graduate School, ICAR-IARI, New Delhi. pp. 276+xii.

Sharma A and Sharma RP 2016. Effect of boron and lime on productivity of garden pea under acidic soils in the north-western Himalayas. Communications in Soil Science and Plant Analysis **47(3):** 291-297. https://doi.org/10.1080/00103624.2015.1122798

Sharma A, Sharma RP and Singh S 2016. Influence of *Rhizobium inoculation*, split nitrogen applications and plant geometry on productivity of garden pea (*Pisum sativum* L.) in an acid alfisol. Legume Research **39(6):** 955-961. https://doi.org/10.18805/lr.v39i6.6642

Sharma A, Sharma RP, Katoch V, Sharma GD 2018. Influence of vermicompost and split-applied nitrogen on growth, yield, nutrient uptake and soil fertility in pole type French bean (*Phaseolus vulgaris* L.) in an acid alfisol. Legume Research **41(1):** 126-131. https://doi.org/10.18805/lr.v0iOF.9107

Thakur KS, Kumar A and Manuja S 2005. Performance of promising varieties of Gobhi Sarson (*Brassica napus*) at different nitrogen levels. Indian Journal of Agronomy **50(1):** 67-69. https://doi.org/10.59797/ija.v50i1.5065

Thakur KS, Mankotia BS, Manchanda A and Kumar D 2012. Performance of mustard hybrids (*Brassica juncea* L) at varying crop geometries in low-hills of Himachal Pradesh. Himachal Journal of Agricultural Research **38(1):** 77-79.