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Seed Yield Evaluation and Association between Yield Components in Different Advanced Lines of Mustard (*Brassica juncea* L.)

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Abstract: *Pakistan is spending a large amount of foreign exchange on the import of huge quantity of edible oil which is snowballing every year due to increase in demand and population. The present study was conducted to study the relationship between different yield related traits in advance lines of Brassica juncea developed through pedigree method of plant breeding. The yield performance of these advance lines was also evaluated during the experiment. Twelve lines were grown in Randomized Complete Block Design with three replications during winter 2015-16. All the recommended cultural practices were used throughout the experiment. The data for plant height, days to flowering, days to maturity, branches per plant, seeds per silique, seed yield per plot and oil% was collected. The correlation analysis revealed that seed yield per plot was highly and significantly correlated with number of branches per plant and seeds per siliqua. RBJ-11008 and RBJ-12018 were produced significantly higher seed yield (2.21kg/plot) & (2.10kg/plot) respectively than the check variety Khanpur Raya. The present study has clearly indicated the need for giving due weightage for number seeds per siliqua and number of branches per plant for improving seed yield in Mustard.*

Keywords: *Correlation, Genotype, Mustard, Siliqua and Seed Yield*

INTRODUCTION

Mustard (Brassica juncea L.) is amphidiploid (AABB genome, 2n=36) and is believed to have arisen through inter-specific cross between Brassica rapa L. (Brassica campestris, genome=AA, 2n=20) and Brassica nigra L. (genome=BB, 2n=16). B. juncea is belonging to the family Brassicaseae (cruciferae). B. juncea originated in minor Asia and southern Iran and center of origin is Middle East and China (Song et al., 1988).

Pakistan has agro based economy, there is large difference between the consumption and the production and this gap is increasing annually. Production of edible oil in Pakistan is not meeting its requirement due to its increasing demand with rapid growing population (Mahmood, et al., 2017). Consequently, a big volume of required edible oil is compensating through its import (Hasan, et al., 2015). During the year 2013-14, the local production of 0.573 million tonnes against the 3.20 million tonnes total need of edible oil and imported 2.627 million tonnes of edible oil worth US$ 2.50 billion (Govt. of Pakistan, 2014-15).

Brassica juncea is used as a vegetable, condiments and oilseeds but in Pakistan or Indian sub-continents it is mostly grow for the purpose of edible oil (Chen et al., 1997). Brassica juncea is important oilseed crop in Pakistan due to early maturity, non-shattering type, heat and pest resistance. Yield is an ultimate trait which is dependent on many other parameters which are mostly inherited quantitatively. (Tuncturk & Ciftci, 2007).

Yield is quantitatively inherited trait and depends upon many other characters or traits. These characters are also inherited quantitatively. The contribution of these parameters in yield is also influenced by environment (Yadava et al., 2011). To study the interaction between two characters simple correlation analysis is used. A plant breeder should know about the importance of correlation because correlation shows the relationship between the different variables which are helpful in making decision in selection for breeding program (Engqvist & Becker, 1993). The present study was planned to estimate correlation coefficient between different yield related traits in mustard and evaluate the performance of different advanced lines on basis of seed yield.

The Oilseeds Research Institute, Faisalabad (Pakistan) is working on the development of canola quality varieties in mustard. The breeding program is aiming to develop high yielding canola quality B. juncea cultivars along with non- shattering, short duration, disease tolerant and good drought/heat tolerant traits.

Material and Methods:

The research trial was conducted during winter season 2015-16 at research area of Oilseeds Research Institute, Faisalabad, Pakistan. Twelve genotypes of Brassica juncea with different genetic makeup were selected for Advance Yield Trial on the basis of seed yield performance in Preliminary Yield Trial (PYT) 2014-15 viz; RBJ-11008, RBJ-11048, RBJ-12018, RBJ-12021, RBJ-13029, RBJ-13033, RBJ-13051, RBJ-14002, RBJ-14011, RBJ-14012, RBJ-14020, RBJ14021 and Khanpur Raya was used as check variety. The trial was sown in Randomized Complete Block Design (RCBD) with three replications. Each entry was sown in three rows of 5 m length. Seeds were planted with Hand Seed Drill by maintaining 45cm distance between the rows. So, the plot size for each genotype was 16.5 feet long and 4.5 feet wide in each replication. All recommended agronomic and cultural practices were applied throughout the growing period. Five plants were randomly selected and tagged to record data for plant height, days to flowering, days to maturity, branches per plant, seeds per silique and oil%. Seed yield per plot was also recorded for each genotype in all replications. Correlation analysis was performed to estimate the relationship between different traits and seed yield as described by Kwon and Torrie (1964). The oil content of each advance line was estimated by Soxhlet apparatus in Hi-tech Oil Technology Laboratory, Oilseeds Research Institute, Faisalabad, Pakistan.

Results and Discussion:

Variation is the basic necessity for improvement in any breeding or selection system. All the 13 genotypes had different genetic makeup and differ significantly from each other. The Table 01, showed the mean values of all traits under study during the experiment while the Figure 01, exhibited the overall comparison between genotypes for different yield components. The maximum plant height was observed in RBJ-14012 (239 cm) while minimum plant height was observed in RBJ-13051 (153 cm) and all the others genotypes had less plant height than the RBJ-14012. RBJ-11008 produced maximum seed yield (2.21kg/plot) associated with maximum number of branches/plant (11) and maximum number of seeds per siliqua (23 seeds per siliqua) and mature in 150 days. The maximum oil (43%) was extracted in RBJ-13029.

Table 02, showed the correlation between different yield components. Branches per plant did not show any relationship with days to flowering and days to maturity. Branches per plant negatively correlated with plant height. Branches per plant showed highly significant and positive correlation with seeds per silique and seed yield per plot. Similar results were reported by chowdhury et al., (1987); Somu (2001); Srivastava and Singh (2002) and Doddabhimappa et al., (2009).

The data showed there is positive correlation between days to flowering and days to maturity. No relationship was observed between the days to flowering and plant height. Data showed positive correlation between the days to flowering and days to maturity but no effect was observed on seed yield. Similar results were reported by Sinha et al. (2001). The days of flowering showed no correlation with plant height, number of seeds per silique and oil content.

The plant height showed highly significant and negative correlation with seeds/siliqua and seed yield i.e. a decrease was observed in seed/siliqua and seed yield with increase in plant height similar results were reported by Nagaraja (1990), Shalini (1998) and Somu (2001).

The analysis showed a highly significant and very strong positive correlation between the number of seeds per siliqua and seed yield/plot. High seed yield was observed with increase in number of seeds/siliqua. Similar results were reported by Yadava (1973); Singh & Singh (1974); Paul et al., (1976); Sirohi et al., (2004) and Doddabhimappa et al., (2009).

Table 01: Mean data for different traits.

Sr. #	Entries	Days to 50% flowering (DF)	Days to maturity (DM)	Plant Height (cm)	Branches/Plant	Seeds/siliqua	Yield (kg/plot)	Oil%
1	RBJ-11008	66	150	161	11	23	2.21	40
2	RBJ-11048	73	151	202	8	17	1.80	37
3	RBJ-12018	74	152	217	6	14	1.59	40
4	RBJ-12021	73	151	194	8	17	1.77	39
5	RBJ-13029	58	147	208	7	16	1.74	43
6	RBJ-13033	57	150	199	7	17	1.75	41
7	RBJ-13051	63	146	153	10	21	2.10	41
8	RBJ-14002	72	151	191	6	13	1.41	37
9	RBJ-14011	80	153	170	7	17	1.74	42
10	RBJ-14012	73	151	239	5	12	1.17	41
11	RBJ-14020	75	150	217	6	14	1.37	40
12	RBJ-14021	81	152	169	9	19	1.85	41
13	Khanpur Raya (C)	74	152	181	8	18	1.83	42

Figure 01: Comparison between different genotypes for yield components.

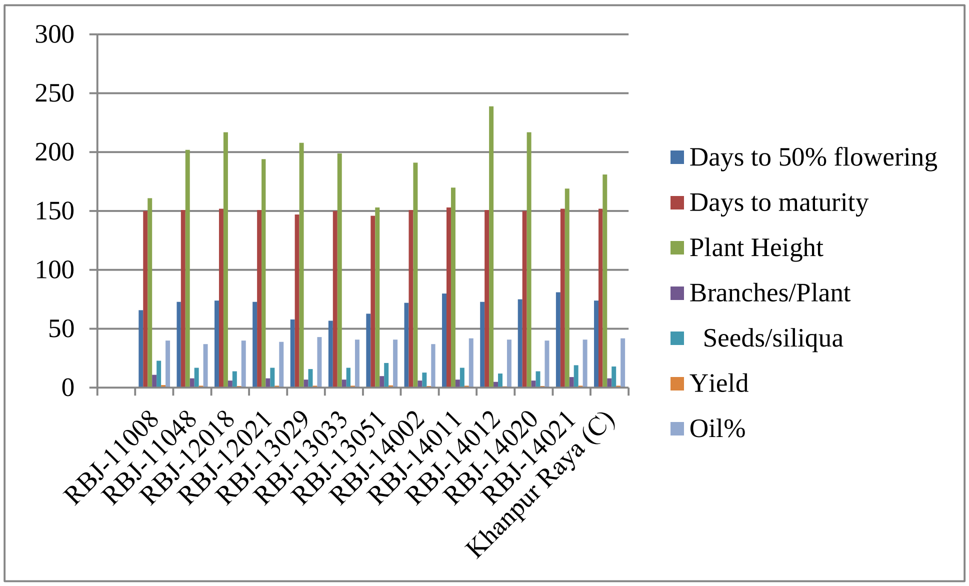
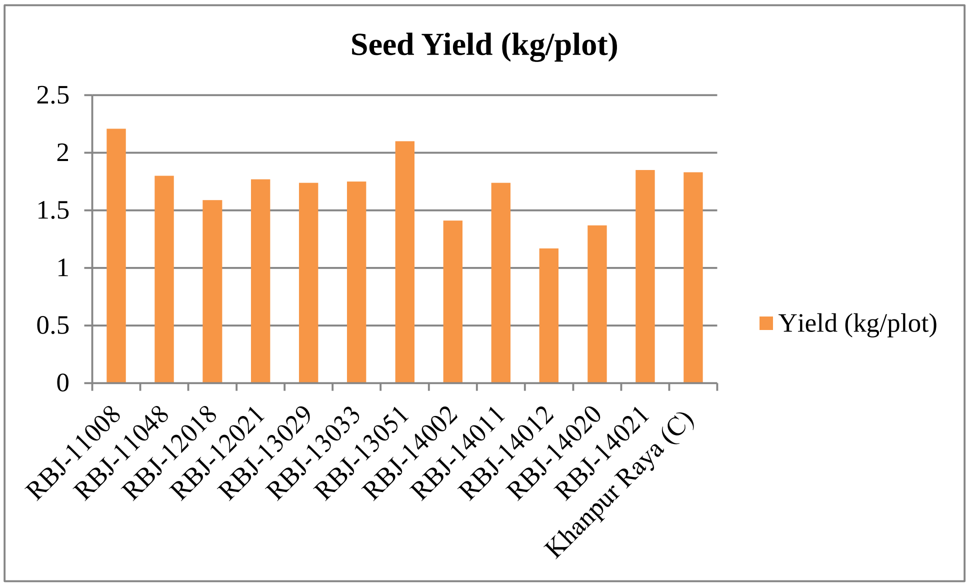


Table 02: Correlation between different traits.

	Branches	DF	DM	Oil%	Height	Seeds/siliqua
DF	-0.1733					
P-VALUE	0.5712					
DM	-0.2998	0.7743				
	0.3196	0.0019				
Oil%	0.0500	-0.2140	-0.2067			
	0.8713	0.4826	0.4980			
Height	-0.8408	-0.0029	0.1340	-0.1050		
	0.0003	0.9926	0.6624	0.7329		
Seeds/siliqua	0.9782	-0.2201	-0.2781	0.1925	-0.8520	
	0.0000	0.4700	0.3575	0.5288	0.0002	
Seed Yield	0.9458	-0.2856	-0.2991	0.1571	-0.8338	0.9674
	0.0000	0.3442	0.3208	0.6083	0.0004	0.0000

Figure 02, clearly exhibited the seed yield comparison between different advance lines of Brassica juncea. Three lines (RBJ-11008, RBJ-13051 & RBJ-14021) produced higher seed yield than the check variety Khanpur Raya while other nine lines (RBJ-11048, RBJ-12018, RBJ-12021, RBJ-13029, RBJ-13033, RBJ-14002, RBJ-14011, RBJ-14012 & RBJ-14020) showed lower seed yield than the check variety. RBJ-11008 & RBJ-12018 were produced highest seed yield (2.21kg/plot) & (2.10kg/plot) respectively.

Figure 02: Yield performance of different advance lines.



Conclusion:

It is concluded from results of experiment that the number of seeds per siliqua and number of branches per plant are the yield contributing traits in Mustard (Brassica juncea L.). Brassica breeders should select plant with more number of seeds/siliqua and more number of branches/plot to develop high yielding Mustard cultivars. Furthermore, RBJ-11008 & RBJ-12018 should be evaluated in Micro Yield Trials to check the yield stability in different agro-ecological zones.

References:

Chen, B., Y.B.F. Cheng, H.L. Liu and T.D. Fu. 1997. The Chinese mustard (Brassica juncea) resources. Cruciferae Newsl., 19: 7-8.

Chowdhury, B.D., S.K. Thukral. D.P.Singh, P. Singh and A . Kumar. 1987. Combining abilities and components of variation in Brassica compestris. Reporter. 4(2):125129.

Doddabhimappa R. Gangapur, B. G. Prakash, P. M. Salimath, R. L. Ravikumar AND M. S. L. Rao. 2009. Correlation and path analysis in Indian mustard (Brassica juncea L.Czern and Coss). Karnataka J. Agric. Sci., 22 (5):971-977.

Engqvist MG, Becker HC. 1993. Correlation studies for agronomic characters in segregating families of spring oilseed rape (Brassica rapa L.). Hereditas 118, 211-216.

Govt. of Pakistan. 2014-15. Pakistan Economic Survey. Ministry of Finance, Economic Advisor's Wing, Islamabad.

Hasan, E., T. Bibi, H.S.B. Mustafa, T. Mahmood, M.T.A. Kalyar and J. Salim. 2015. Genetic evaluation and characterization for yield and related traits in mustard (Brassica juncea L.). Res. J. Agri. Environ. Management. 4(2):82-87.

Kwon S.H., J.H. Torrie, 1964 - Heritability and interrelationship among traits of two soybean population. Crop Sci., 4: 196-198.

Mahmood T, Hussain M., Mustafa H.S.B., Hasan E. and Aftab M. 2017. AARI CANOLA: Pakistan's first ever canola quality and short duration Mustard (Brassica juncea L.) cultivar resilient to climate change. Int. J. Biol. Pharm. Al. Sci. 6(4): 777-787.

Nagaraja, T. E., 1990, Genetic variability study in Rapeseed (Brassica compestris L.) and Mustard (Brassica juncea L.) Czern and Coss). M.Sc. (Agri.) Thesis, Univ. Agric. Sci. Bangalore (India).

Paul, N.E.K., 001, Joarder and A.M. Eunus. 1976. Genotypic and phenotypic variability and correlation studies in Brassica juncea L. Zeitschrift fùr pflanzenzuchzung, 77: 45454.

Shalini, T. S., 1998, Genetic divergence in Indian mustard [Brassica juncea L. (Czern and Coss)]. M.Sc. (Agri.) Thesis, Univ. Agric. Sci., Bangalore (India).

Singh D.P & and D. Singh. 1974. Correlations in Indian Colza (Brassica campestris L. var. Sarson Prain). Ind. Agri, Sci,, 44: 1424 440.

Sinha P., S.P. Singh, I.D. Pandey, 2001 - Character association and path analysis in Brassica species. Indian J. Agri. Res., 35(1):63•65.

Sirohi, S.P.S., Sanjai, M. and Ashok K. 2004. Correlation and path analysis of Indian mustard (Brassica juncea L.) Czern and Coss). Ann. Agric. Res., 25: 491-494.

Somu, G. 2001. Genetic divergence in Indian mustard (Brassica juncea L. Czern and Coss.). M.Sc.(Agri.) Thesis, Univ. Agric. Sci., Bangalore (India)

Song, K. M., Osborn, T. C., & Williams, P. H. 1988. Brassica taxonomy based on nuclear restriction fragment length polymorphisms (RFLPs). Theoretical and Applied Genetics, 75(5), 784-794.

Srivastava, M. K. and Singh, B. P., 2002, Correlation and path analysis in Indian mustard (Brassica juncea L.) Czern and Coss). Crop Res. Hisar, 23: 517-521.

Tuncturk M., V. Ciftci. 2007 - Relationships between yield and some yield components in rapeseed (Brassica napus ssp. oleifera L.) cultivars by using correlation and path analysis. Pak. J. Bot., 39(1): 81-84.

Yadava, D.K., S.C. Giri, M. Vignesh, S. Vasudev, A.K. Yadav, B. Dass, R. Singh, N. Singh, T. Mohapatra and K.V. Prabhu. 2011. Genetic variability and trait association studies in Indian mustard (Brassica juncea) Indian J. Agri. Sci. 81:712-6.

Yadava, T.P. 1973. Variability and correlation studies in Brassica juncea L. Madras Agric. J. 60: 9-1 2.