Biological Forum – An International Journal **14(3): 780-785(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Studies in ASD 16 × Improved Pusa Basmati 1 RIL Population for yield and Physical properties in Rice (*Oryza sativa* L.)

V. Blessy[1], E. Murugan[2*], R. Suresh[3], R.P. Gnanamalar[2], S. Vellai Kumar[4] and S. Kanchana[5]

[1]Department of Plant Breeding and Genetics, AC&RI, Madurai (Tamil Nadu), India.
[2]Professor, Plant Breeding and Genetics, AC&RI, Madurai (Tamil Nadu), India.
[3]Assistant Professor, Department of Rice, TNAU, Coimbatore (Tamil Nadu), India.
[4]Associate Professor, Department of Biotechnology, TNAU, Coimbatore (Tamil Nadu), India.
[5]Dean, Community Science College and Research Institute, Madurai (Tamil Nadu), India.

(Corresponding author: E. Murugan)*
(Received 09 June 2022, Accepted 27 July, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The present study was carried out from the segregating population of F_3 generations of the cross "ASD16 × Improved Pusa Basmati 1" to determine genetic variability, degree of association between yield and its component traits. Two sets *viz.*, long slender type and medium grain type RIL's were taken for the above study. The extent of phenotypic coefficient of variation (PCV) was in general high compared to genotypic coefficient of variation (GCV) for all the traits. Yield and its contributing characters had high heritability coupled with high genetic advance in both categories. High heritability coupled with moderate genetic advance was exhibited by kernel length and kernel breadth in the medium slender category. Moderate heritability coupled with low genetic advance was exhibited by kernel length- breadth ratio in long slender grain category. Based on the correlation and path analysis positive significance association and direct effects were exhibited by plant height, number of productive tillers, number of filled grains per panicle and kernel breadth in long slender category. In medium slender category the positive significant association and direct effects were exhibited by plant height, number of productive tillers, number of filled grains per panicle and kernel length. As Improvement of yield along with quality is the major challenge for the breeders. Selection of Genotypes based on the above said parameters were reliable.

Keywords: Rice, grain types, Phenotypic coefficient of variation, genotypic coefficient of variation, heritability, genetic advance per mean percent, correlation and path analysis.

INTRODUCTION

Rice is the staple food crop for majority of the countries in the world. The major rice producing states are West Bengal, Uttar Pradesh, Punjab, Tamil Nadu, Andhra Pradesh, Bihar, Chhattisgarh, Odisha, Assam, and Haryana in India. The production of rice during 2020-21 was 121.46 million tonnes. It was higher by 9.01 million tonnes against five years' average production of 112.44 million tonnes. As India attained self-sufficiency in the food grain production, a paradigm shift has happened towards the rice quality improvement. Rice quality is the driving force which determines the consumer acceptance. The definition of rice quality is uncertain and differed from geographical area, economic condition of the people and consumer acceptance. Rice has been classified as premium, good and poor quality. According to the Indian standards, premium grade consists of India's famous Basmati type with aroma and good quality rice with long, medium and short slender grains with or without aroma along with good palatability and taste. Indians prefer linear expansion in grains than volume expansion of rice, less water to cook and with less sticky (intermediate amylose) in nature. Poor quality rice is mostly bold, sticky with more breakages. Indian cosmopolitan varieties have evolved by making quality as a paramount importance along with pest and disease resistance and high yield. India, one of the largest exporters of rice in the world, exports more non-Basmati types than Basmati types with 8217.26 million tonnes. While Basmati types accounts 3380.65 million tonnes (INDIASTA, 2021). The major importers are Nepal followed by west African country Benin. According to the DGCIS data, India exported non-basmati rice worth USD 2015 million in 2019-20, which rose to USD 4799 million in 2020-21 and USD 6115 million in 2021-22. Hence present study was under taken with ASD 16 and Improved Pusa Basmati 1 to get desirable segregants for long slender aromatic types and short and, medium slender non aromatic types. ASD 16 is the short bold, grain type with high yield potential. IPB 1 was a long slender grain with exceptional cooking quality, expands linearly rather than breadth wise with good aroma. Variability studies indicate the presence of more variation present in the population for several traits which is an important tool for the development of a good quality traits. Heritability and genetic advance are important for transfer of character to the next generation and helps in fixing the

desirable trait. Correlation and path analysis revealed the degree and direction of the trait. Path analysis splits the correlation coefficient in to direct and indirect effect and thus helps the plant breeder to select the other trait connected with dependent trait.

MATERIALS AND METHODS

ASD16 and Improved Pusa Basmati 1(IPB 1) were taken for the present study. In the F_3 generation, two hundred and thirty-eight RIL's were selected and raised in single seed decent method without replication. The 238 RIL's were divided as two categories based on length and breadth. Among 238 RIL's Ninety RIL's were long-slender grains (>6.61-7.5 mm) (slender>3.00) type and one hundred and nineteen RIL's were under medium slender (5.51-6.60 mm) ((slender>3.00) category. Observations were recorded for each RIL for the traits *viz.,* days to 50% flowering, plant height, number of productive tillers, panicle length, number of filled grains per panicle, hundred seed weight, single plant yield and physical properties *viz.,* kernel length, kernel breadth and kernel length-breadth ratio. Based on the data obtained, T NAUSTAT software was used to analyse the mean performance, correlation (Snedecor and Cochran 1967) and path analysis as suggested by Dewey and Lu (1959).

RESULTS

The results obtained from the above data were discussed separately for each category. In the long slender category range for days to 50 percent flowering was 81 to 1178 days where as for plant height ranges from 69 to 147.5 cm. Panicle length ranged from 15 to 35cm, number of the productive tillers from 6 to 27. Regarding the number of the filled grains ranged from100 to 200, hundred grain weight 2.04g to 4.04 g and for the single plant yield 11.0 g -37.5g. kernel length ranged from 6.6-7.5 mm with kernel breadth 1.8-2.6 mm and for kernel L/B ratio 2.58-4.17mm (Table 1).

Table 1: Mean and range table for long and medium slender grain type.

Characters	Mean Long slender grains	Range		Mean Medium slender grains	Range	
		(minimum)	(maximum)		(minimum)	(maximum)
Days to 50% flowering	100.5	81.1	118	98.2	72.6	123.3
Plant height	101.3	69.0	147.5	101.2	73.5	150.0
Number of productive tillers per plant	18.5	6	27	18.7	7	27
Panicle length	25.4	15	35	26.9	18.5	36
Number of filled grains per panicle	159.1	100	200	157.2	110	220
Hundred seed weight	2.7	2.0	4.4	2.8	2.04	3.93
Single plant yield	25.6	11	37.5	25.8	10.4	39.5
Kernel length	7.0	6.7	7.5	6.2	5.5	6.6
Kernel breadth	2.0	1.8	2.6	2.1	1.7	2.6
Kernel length-breadth ratio	3.4	2.58	4.17	2.9	2.15	3.82

In the medium slender category days to 50% flowering registered 72 to 123 days, plant height from 73 to 150 cm, number of productive tillers ranges from 10 to 27. Regarding panicle length, which ranged from 18.5 to 36 cm in length. The number of filled grains had range from 11 to 220. The hundred grain weight from 2.04 to 3.93 g, single plant yield has shown wide variation of 10-39.5g. The kernel length was from 5.5 to 6.6 mm, kernel breadth ranged from 1.7-2.6 mm and the L/B ratio was from 2.15-3.82 mm (Table 1).

In the long slender grain category, the mean for days to the 50% flowering was100 days, plant height (101.3 cm), number of productive tillers (18.5), panicle length (25.4cm), number of filled grains per panicle was (159.1) and hundred grain weight was (2.7 g). Regarding single plant yield the mean exhibited was (25.6) g. The kernel length (7.0mm) and kernel breadth (2.0mm) and for kernel L/B ratio (3.4mm) (Table 1).

Regarding medium slender category the mean for days to 50% flowering showed 92.8 days, plant height (101.2cm),number of productive tillers (18.7), panicle length was (26.9cm), number of filled grains per panicle (157.2), hundred grain weight (2.8 g) single plant yield (25.8 g). Mean for kernel length (6.2 mm), kernel breadth (2.1 mm) and L/B ratio of 2.9 mm (Table 1).

Phenotypic and Genotypic coefficient of variation. The magnitude of PCV and GCV values did not exhibited notable differences in both of the categories. In the long slender grain type, the values of PCV and GCV were high for number of productive tillers of 23.4 and 21.6 respectively. The single plant yields the PCV was 22.4 and GCV 21.5. Moderate PCV and GCV were

recorded for number of filled grains per panicle (15.9), (15.2), panicle length (15.3), (14.3), plant height (14.8) and (14.2) respectively. Regarding hundred grain weight PCV and GCV values were (14.1), (12.4) respectively where as Low PCV and GCV value was recorded for Kernel L/B ratio, kernel breadth and kernel length (Table 2).

In the medium slender grain type high PCV and GCV was observed by number of productive tillers per plant (26.1), (23.7), single plant yield (24.2), (23.3). Moderate PCV and GCV was observed for number of filled grains per panicle (16.2),(15.5) followed by panicle length (14.5), (13.5) and plant height (14.1), (13.7) in the F_3 generation (Table 3).

Table 2: Phenotypic and genotypic coefficient of variation for quantitative and qualitative traits of long slender grain types in F_3 generation.

Characters	PCV	GCV	h2	GAPM
Days to 50% flowering	9.4	8.8	88.9	17.1
Plant height	14.8	14.4	94.2	28.8
Number of productive tillers per plant	23.4	21.6	85.2	41.0
Panicle length	15.3	14.3	87.1	27.5
Number of filled grains per panicle	15.9	15.2	91.4	29.9
Hundred seed weight	14.1	12.4	77.7	22.5
Single plant yield	22.4	21.5	91.7	42.4
Kernel length	3.2	2.8	72.8	4.8
Kernel breadth	7.8	6.1	61.1	9.9
Kernel length- breadth ratio	8.4	4.8	32.7	5.6

Table 3: Phenotypic and genotypic coefficient of variation for quantitative and qualitative traits of medium and medium slender grain types in F_3 generation.

Characters	PCV	GCV	h2	GAPM
Days to 50% flowering	10.4	10.4	99.8	21.5
Plant height	14.1	13.7	93.6	27.2
Number of productive tillers per plant	26.1	24.5	88.3	47.5
Panicle length	14.5	13.5	87.2	26.1
Number of filled grains per panicle	16.2	15.5	91.5	30.5
Hundred seed weight	14.5	12.9	79.6	23.7
Single plant yield	24.2	23.3	93.0	46.3
Kernel length	4.8	4.4	84.0	8.3
Kernel breadth	8.6	7.2	69.7	12.4
Kernel length- breadth ratio	11.2	8.0	50.4	11.7

Heritability and Genetic advance as percentage of mean. In the long slender grain type high heritability coupled with high genetic advance as percent of mean was detected for single plant yield (91.7), (42.4), followed by number of productive tillers (85.2), (41). The traits like, plant height (94.2), (28.8), number of filled grains per panicle (91), (29) and hundred grain weight (77.7), (22.5) also revealed the presence of high heritability with high genetic advance. High heritability coupled with moderate genetic advance was recorded for the days to 50% flowering (88.9), (17.1). respectively. Similarly, high heritability with low genetic advance has been observed for Kernel length (72.8), (4.8) kernel breadth (61.1), (9.9) respectively. Moderate heritability with low genetic advance was exhibited for kernel length-breadth ratio (32.7) and (5.6) (Table 2).

In the medium slender grain type high heritability coupled with high genetic advance was exhibited by single plant yield (93) and (46.3), plant height (93.6), (27.2), number of productive tillers per plant (88.3), (47.5) panicle length exhibited (87.2), (26.1) hundred grain weight (79.6), (23.7). High heritability with moderate genetic advance was observed for days to 50% flowering (69.7), (12.4), and kernel breadth (69.8), (12.48). Similarly, high heritability coupled with low genetic advance was observed for kernel length (84.0), (8.3) (Table 3).

Association study for long slender grain type. Correlation coefficient is a statistical measure which is found out to measure the degree of relationship between two or more variables. It is represented by 'r'. In the long slender grain type number of productive tillers (0.74), number of filled grains per panicle (0.58), plant height (0.34) and kernel breadth (0.20) showed positive and highly significant association with the single plant yield. Whereas days to 50% flowering showed (-0.41) negative the kernel L/B ratio (-0.21) had negative association with the single plant yield. Positive and significant intercorrelation was observed between panicle length and plant height (0.46). Similarly, positive with high significant inter-association was observed between number of filled grains to the plant height (0.31), number of productive tillers (0.27), same was observed between kernel breadth and number of filled grains (0.23). Kernel L/B ratio showed positive

and high significance with kernel length (0.45) but it has high negative significance with kernel breadth (-0.92) followed by the number of filled grains (-0.21) (Table 4). Regarding path analysis high direct effects was exhibited by number of productive tillers per plant (0.56) followed by number of filled grains per panicle (0.36) to single plant yield. Number of filled grains showed low positive in direct effect through number of productive tillers (0.15) on yield (Table 5).

Association analysis for medium slender grain type. In the medium slender group, single plant yield showed positive and highly significant association with the number of productive tillers (0.78). Followed by number of filled grains (0.65), plant height (0.34) and kernel length (0.15). Similarly, panicle length exhibited positive and significant inter-association with plant height (0.52). Similarly, number of filled grains showed positive and significant intercorrelation with plant height (0.34) and with number of productive tillers per plant (0.41). Regarding kernel length showed positive significant inter-association with plant height (0.21). Kernel breadth it had a significant negative association with kernel length (-0.36). Kernel L/B ratio showed positive and significant inter- association with Kernel length (0.68) and negative association with kernel breadth (-0.92) and days to 50% flowering (-0.19) (Table 6). Path analysis revealed that high and positive direct effect was registered by number of productive tillers per plant (0.57), number of filled grains per panicle (0.36) and negative indirect effect with kernel length -breadth ratio (-0.17). Number of filled grains per panicle showed positive indirect effect on single plant yield through number of productive tillers per plant (0.23). Number of productive tillers per plant showed positive and indirect effect on single plant yield through number of filled grains per panicle. Regarding and kernel l/b ratio it was positive with kernel breadth (0.15) (Table 7).

Table 4: Correlation coefficient of variation for the long slender grain types in the F_3 generation.

	Days to 50% flowering	Plant height (Cm)	Number of productive tillers per plant	Panicle length (Cm)	Number of filled grains per panicle	Hundred seed weight(g)	Kernel length (mm)	Kernel breadth (mm)	Kernel length-breadth ratio(mm)	Single plant yield (g)
Days to 50% flowering	1									-0.4157**
Plant height (Cm	-0.2082**	1								0.3524**
Number of productive tillers per plant	-0.3206**	0.15	1							0.7467**
Panicle length (Cm)	-0.0828	0.4866**	0.0702	1						0.1509
Number of filled grains per panicle	-0.1245	0.3165**	0.2794**	0.1679	1					0.5869**
Hundred seed weight(g)	-0.024	-0.0261	-0.007	-0.1364	0.0661	1				-0.0391
Kernel length (mm)	0.0033	-0.0275	-0.0932	-0.0859	-0.0393	-0.1812	1			-0.0986
Kernel breadth (mm)	-0.0662	0.0146	0.1173	-0.0363	0.235**	0.0347	-0.0957	1		0.2073**
Kernel length-breadth ratio (mm	0.0696	-0.0356	-0.1164	-0.0253	-0.2138**	-0.1109	0.4573**	-0.9219**	1	-0.2045**

Table 5: Direct and indirect effects of long slender grain types in the F_3 generation.

	Days to 50% flowering	Plant height (Cm)	Number of productive tillers per plant	Panicle length (Cm)	Number of filled grains per panicle	Hundred seed weight(g)	Kernel length (mm)	Kernel breadth (mm)	Kernel length-breadth ratio(mm)	Single plant yield (g)
Days to 50% flowering	**-0.1651**	-0.0279	-0.1804	0.0031	-0.0455	0.0017	-0.0003	-0.0096	0.0082	-0.4157**
Plant height (Cm	0.0344	**0.1342**	0.0844	-0.0184	0.1158	0.0019	0.0023	0.0021	-0.0042	0.3524**
Number of productive tillers per plant	0.0529	0.0201	**0.5626**	-0.0027	0.1022	0.0005	0.0078	0.0169	-0.0137	0.7467**
Panicle length (Cm)	0.0137	0.0653	0.0395	-0.0378	0.0614	0.0098	0.0072	-0.0052	-0.003	0.1509
Number of filled grains per panicle	0.0205	0.0425	0.1572	-0.0064	**0.3658**	-0.0048	0.0033	0.0339	-0.0252	0.5869**
Hundred seed weight(g)	0.004	-0.0035	-0.004	0.0052	0.0242	-0.0721	0.0152	0.005	-0.0131	-0.0391
Kernel length (mm)	-0.0005	-0.0037	-0.0524	0.0033	-0.0144	0.0131	-0.0841	-0.0138	0.054	-0.0986
Kernel breadth (mm)	0.0109	0.002	0.066	0.0014	0.086	-0.0025	0.008	**0.1444**	-0.1088	0.2073**
Kernel length-breadth ratio (mm	-0.0115	-0.0048	-0.0655	0.001	-0.0782	0.008	-0.0384	-0.1331	**0.118**	-0.2045**

Table 6: Correlation coefficient of variation for the medium slender types in the F_3 generation.

	Days to 50% flowering	Plant height (Cm)	Number of productive tillers per plant	Panicle length (Cm)	Number of filled grains per panicle	Hundred seed weight(g)	Kernel length (mm)	Kernel breadth (mm)	Kernel length-breadth ratio(mm)	Single plant yield (g)
Days to 50% flowering	1									-0.5075**
Plant height (Cm	-0.2102**	1								0.3461**
Number of productive tillers per plant	-0.4046**	0.3418**	1							0.7829**
Panicle length (Cm)	0.0335	0.5212*8	0.0236	1						0.0574
Number of filled grains per panicle	-0.3169**	0.2234*8	0.4136**	0.0304	1					0.6524**
Hundred seed weight(g)	-0.0498	0.0171	0.0083	-0.1317	0.0632	1				0.0793
Kernel length (mm)	-0.2064**	0.2128**	0.1646	-0.067	0.0462	-0.1596	1			0.1501*
Kernel breadth (mm)	0.1612	-0.0936	0.0329	-0.0134	-0.0059	0.0605	-0.3699**	1		-0.0823
Kernel length-breadth ratio (mm	-0.1995**	0.1652	0.0313	-0.0163	0.0146	-0.1154	0.6889**	-0.9203**	1	0.1127

Table 7: Direct and indirect effects of medium slender types in the F_3 generation.

	Days to 50% flowering	Plant height (Cm)	Number of productive tillers per plant	Panicle length (Cm)	Number of filled grains per panicle	Hundred seed weight(g)	Kernel length (mm)	Kernel breadth (mm)	Kernel length-breadth ratio(mm)	Single plant yield (g)
Days to 50% flowering	-0.1456	-0.0037	**-0.2312**	0.0011	-0.1144	-0.0025	-0.0068	-0.0278	0.0234	-0.5075**
Plant height (Cm	0.0306	0.0176	**0.1953**	0.0173	0.0807	0.0009	0.007	0.0161	-0.0194	0.3461**
Number of productive tillers per plant	0.0589	0.006	**0.5714**	0.0008	0.1493	0.0004	0.0054	-0.0057	-0.0037	0.7829**
Panicle length (Cm)	-0.0049	0.0092	0.0135	0.0332	0.011	-0.0067	-0.0022	0.0023	0.0019	0.0574
Number of filled grains per panicle	0.0461	0.0039	**0.2363**	0.001	0.361	0.0032	0.0015	0.001	-0.0017	0.6524**
Hundred seed weight(g)	0.0073	0.0003	0.0047	-0.0044	0.0228	0.0507	-0.0053	-0.0104	0.0136	0.0793
Kernel length (mm)	0.03	0.0038	0.0941	-0.0022	0.0167	-0.0081	0.033	0.0637	-0.0809	0.1501*
Kernel breadth (mm)	-0.0235	-0.0017	0.0188	-0.0004	-0.0021	0.0031	-0.0122	**-0.1723**	0.108	-0.0823
Kernel length-breadth ratio (mm	0.0291	0.0029	0.0179	-0.0005	0.0053	-0.0059	0.0228	0.1586	-0.1174	0.1127

DISCUSSION

The extent of phenotypic coefficient of variation (PCV) in general was found to be higher than genotypic coefficient of variation (GCV) for all the traits included in the study indicated the influence of environment on the expression of these characters. The high magnitude of GCV and PCV for the traits indicated the presence of high degree of variability and so there will be better scope for the improvement of the trait through simple selection. In the present study number of productive tillers, single plant yield and exhibited high heritability with high genetic advance. Similar results were reported for number of productive tillers and single plant yield by Kahani and Hittalmani (2016); Harsha *et al*. (2017); Sharma and Hemant (2020). The traits exhibiting moderate PCV and GCV the selection for these traits are likely to provide scope for improvement of the trait through selection in their particular environment due to their moderate genetic variability (Paswan *et al*., 2014). In the present study, panicle length, number of filled grains per panicle had moderate PCV and GCV in both categories. Similar kind of findings for panicle length, number of filled grains per panicle was observed by Rukmini *et al*. (2014); Srujana *et al*. (2017); Sharma and Hemant (2020).

According to Panse and Sukhatme (1954) if a character is governed by non-additive gene action, it may exhibit heritability but low genetic advance, whereas if it is governed by additive gene action, high heritability (above 60%) along with high genetic advance (above 20%) provide good scope for further improvement of the trait. Traits governed by high heritability and high genetic advance per mean percent selection of such traits may be rewarding. In the present study, days to 50% flowering, plant height, number of productive tillers, panicle length, number of filled grains per panicle,

hundred grain weight, single plant yield in long and medium slender grain category Similar results for the days to 50% flowering, plant height, number of productive tillers panicle length the number of filled grains per panicle hundred grain weight and single plant yield was obtained by Veni *et al*. (2013); Rukmini *et al.* (2014); Behera *et al*. (2018); Sharma and Hemant (2020). Regarding association analysis single plant yield had significant and positive correlation with plant height, number of productive tillers, number of filled grains per panicle and kernel breadth in long slender grain type group. Whereas in the medium slender grain category also plant height, number of productive tillers, number of filled grains per panicle and kernel length had positive correlation with yield. These results were in accordance with Menaka and Ibrahim *et al.* (2015), Premkumar *et al.* (2015). So, selection of these traits will be more effective towards the improvement of single plant yield in both long and medium slender grain types. In the path analysis plant height, number of productive tillers, number of filled grains per panicle, contributes positive and high direct effect towards the improvement of yield in both long and medium slender grains.

CONCLUSION

Based on the PCV and GCV values, number of productive tillers, number of filled grains, single plant yield in both grain types have high values. Based on the heritability and genetic advance percentage of mean yield and yield attributing traits showed high heritability and high genetic advance percent of mean. As per the correlation and path analysis selection should be based on plant height, number of productive tillers, number of filled grains, kernel breadth in the long slender grain type whereas in the medium slender types plant height, number of productive tillers, number of filled grains, third trait *i.e*., kernel length should be given importance for improving respective quality traits along with high yield.

FUTURE SCOPE

As India exports mostly the non-basmati types this study helps the breeders to select the genotypes based on kernel dimensions and yield attributing characters. As kernel length plays an important role in the consumer acceptance selection of this types, will be helpful.

Acknowledgement. The author is thankful to the co-authors for their timely help throughout the research work and for fine tuning of the manuscript. As well as much indebted to the Tamil Nadu rice research institute, Aduthurai, Thanjavore District and Agricultural College and Research institute, Madurai.

REFERENCES

Behera, B., Sahu, S., Kar, R. K., & Pandey, R. K. (2018). Studies on genetic variability for some metric traits in slender grain rice genotypes. *Journal of Applied and Natural Science*, *10*(1): 375-378.

Dewey, D. R., & Lu, K. (1959). A correlation and path coefficient analysis of components of crested wheatgrass seed production 1. *Agronomy journal*, *51*(9): 515-518.

Harsha, D. I., Kumar, S., & Talha, M. (2017). Assessment of genetic variability and inter-character association studies in rice genotypes (*Oryza sativa* L.). *Int. J. of Current Microbiology and Applied Sci.*, *6*: 2041-2046.

Hossain, S., Maksudul Haque and Jamilur Rahman (2015). Genetic Variability, Correlation and Path Coefficient Analysis of Morphological Traits in some Extinct Local Aman Rice (*Oryza sativa* L). *Rice Research, 4*(1): 1-6.

INDIASTAT2021. https://www.indiastat.com/data/agriculture/rice/data-year/2011-2022.

Kahani, F., & Hittalmani, S. (2016). Identification of F2 and F3 segregants of fifteen rice crosses suitable for cultivation under aerobic situation. *Sabrao Journal of Breeding and Genetics*, *48*(2): 219-229.

Menaka, J. and Ibrahim, S. M. (2015). Correlation and path coefficient analysis for yield and grain quality parameters in rice (*Oryza sativa* L). *International Journal of Agriculture Sciences, 7*(14): 903-906.

Nirmaladevi, G., Padmavathi, G., Kota, S., & Babu, V. R. (2015). Genetic variability, heritability and correlation coefficients of grain quality characters in rice (*Oryza sativa* L.). *SABRAO journal of Breeding and Genetics*, *47*(4): 424-433.

Panse, V. G., & Sukhatme, P. V. (1954). Statistical methods for agricultural workers. *Statistical methods for agricultural workers.*

Paswan, S. K., Sharma, V., Singh, V. K., & Ahmad, A. (2014). Genetic variability studies for yield and related attributes in rice genotypes (*Oryza sativa* L.). *Res. J. Agr. Sci.*, *5*(4): 750-752.

Premkumar, R., Gnanamalar, R. P., & Anandakumar, C. R. (2016). Correlation and path coefficient analysis of grain quality traits in rice (*Oryza sativa* L.). *Indian Journal of Agricultural Research*, *50*(1): 27-32.

Rukmini, Devi., B. Satish Chandra, Y. Hari, and V. Venkanna. (2018). Heterosis and inbreeding studies for agronomic and quality traits in rice (*Oryza sativa* L.). *Agricultural Science Digest-A Research Journal, 38*(4): 313-318.

Sharma, A., & Hemant, K. J. (2020). Coefficient of variation, heritability and correlation coefficient in basmati rice hybrids (*Oryza sativa* L.) for yield and quality traits. *Plant Archives*, *20*(2): 5854-5858.

Srujana, G., Suresh, B. G., Lavanya, G. R., Ram, B. J., & Sumanth, V. (2017). Studies on genetic variability, heritability and genetic advance for yield and quality components in rice (*Oryza sativa* L.). *Journal of pharmacognosy and Phytochemistry*, *6*(4): 564-566.

Snedecor, G. W. and Cochran, W. G. (1967). Statistical methods. 6th Edition, Ames, Lowa, the Lowa state University.

Veni, B. K., Lakshmi, B. V., & Ramana, J. V. (2013). Variability and association studies for yield components and quality parameters in rice genotypes. *Journal of rice research*, *6*(2): 16-23.

How to cite this article: V. Blessy, E. Murugan, R. Suresh, R.P. Gnanamalar, S. Vellai Kumar and S. Kanchana (2022). Studies in ASD 16× Improved Pusa Basmati 1 RIL Population for yield and Physical properties in Rice (*Oryza sativa* L.). *Biological Forum – An International Journal*, *14*(3): 780-785.