Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2021; 10(4): 292-295
Received: 10-05-2021
Accepted: 14-06-2021

GN Hosagoudar
Rice Pathologist and Head, AICRP on Rice, AHRS, Ponnampet, Karnataka, India

Sheshaiah
Rice Breeder on contract basis, AHRS, Ponnampet, Karnataka, India

Corresponding Author:
GN Hosagoudar
Rice Pathologist and Head, AICRP on Rice, AHRS, Ponnampet, Karnataka, India

Comparative performance of elite early duration cold tolerant rice cultures in hill zone of Karnataka

GN Hosagoudar and Sheshaiah

Abstract
Rice (*Oryza sativa* L.) is major staple food crop in India as well as world. The experiment was conducted to study the comparative performance of elite early duration cold tolerant cultures under irrigated condition in hills and to identify the early duration high yielding genotypes. Totally 25 paddy genotypes evaluated in RCBD in two replications. The results indicating that all entries were found significantly early in days to fifty per cent flowering and maturity compared to KPR-1 except IET-28890. Significantly highest plant height recorded in the entries IET-28892 (98.25 cm) followed by IET-28891 (92.63 cm) and 28880 (91.38 cm). Significantly maximum number of panicle *per* plant was observed in IET-28880 (8.75) and the entry IET-28890 (4639 kg/ha) recorded significantly maximum grain yield/ ha compared to local check KPR-1. None of entries recorded low scores than the KPR-1 for leaf blast and neck blast and entries IET-28886, IET- 28887, IET- 28890, IET- 28893 and IET- 28895 recorded less infestation of leaf folder among the 25 entries. The entry IET-28890 is best performing and most promising entry under hilly conditions of Karnataka and it has great value in future breeding programme.

Keywords: blast, genotypes, grain yield, resistant and rice

Introduction
Rice (*Oryza sativa* L., 2n=2x=24) is the major staple food crop of billions of Indians in addition to wheat. India is the second largest producer of rice after China and played key role in food security of the nation. In India, West Bengal is the largest rice producing state. (https://www.mapsofindia.com/answers/states/which-state-is-the-biggest-rice-producer-in-india/) It is widely cultivated under diverse agro-ecosystems ranging from low land rainfed situation to upland irrigated situation and it's cultivation also is a part of socio-cultural life of rural India.

The 1960's green revolution witnessed increased world rice production by developing high yield semi dwarf varieties but now modern varieties is currently declining for its per unit yield performance because of narrow genetic base in (Wouw *et al.*, 2010) [20], several biotic and abiotic stresses (Keneni *et al.*, 2012) [10]. The global rice demand is also expected to rise from 439 million tons (milled rice) in 2010 to 555 million tons in 2035 (http://ricepedia.org/challenges/food-security) and it means rice production is not sufficient to meet the domestic consumption. Potential yield of varieties varies with the ecology as well as the agro-climatic region. Precise knowledge on zone and ecosystem specific potential is a pre-requisite for meaningfully determining the still untapped yield of the currently popular high yielding varieties. Yield is a complex quantitative character and is greatly influenced by environmental fluctuations; hence, the selection for superior genotypes based on yield is important. The objective of the study was to evaluate and identifying rice genotypes by comparing its performance for yield and yield components of rice genotypes.

Materials and Methods
The present experiment was conducted at Agricultural and Horticultural Research Station, Ponnampet. The experimental materials were provided by Indian Institute of Rice Research, Hyderabad to mainly conduct experiment entitled "Initial Variety Trial –Irrigated Early Hills– IVT –E (H)". All 25 entries including AICRIP entries and existing local check KPR-1 were evaluated during *Kharif*-2020 in randomized complete block design (RCBD) with two replications for different growth and yield parameters with pest and disease reactions.

The seedlings of paddy genotypes were raised by sowing of each genotype in nursery bed and 25 days old seedlings were transplanted with a spacing of 15 × 15 cm in a plot size of 5.40 m^2 for each genotype. All agronomic practices were followed based on the zonal recommendations to raise a good crop.

Observations on days to 50 per cent flowering, maturity and yield were taken on whole plot basis. The observations on plant height, panicle number per plant and panicle length were recorded in each replication on five randomly selected plants from each plot. The genotypes also were evaluated for disease reaction especially leaf blast, neck blast and brown spot reaction by following SES scale of IRRI (1996) [8] because the AHRS, Ponnampet is considered as one of the hot spot for rice blast disease hence the genotypes were scored in the nursery and field condition for leaf and neck blast incidence respectively. Brown spot disease scores were taken during flowering stage.

Results and Discussion

The analyses of variance for studied characters are presented in Table 1. The analysis of variance revealed significant differences among the genotypes for all the studied characters (Table 1) indicating the presence of substantial amount of variability among the genotypes. The significant differences for all studied traits were also noticed by Vijaykumar *et al.* (2015) [19], Chandramohan *et al.* (2016) [1], Hosagoudar *et al.* (2017) [4], Hosagoudar and Amadabade (2017) [4], Srujana *et al.* (2017) [17], Sheshaiah *et al.* (2018) [13] and Jiban Shrestha *et al.* (2021) [15].

Elite cold tolerant cultures were evaluated and compared over KPR-1 (recently released blast resistant variety) for traits *viz.*, days to 50 per cent flowering, days to maturity, plant height, number of productive tillers per plant, panicle length, grain yield per hectare. The performance of 25 rice entries for yield and its related traits is presented in Table 2.

The significant variation was observed for days to fifty per cent flowering and it ranged from 80 to 114 days with an average of 93.68 days and for maturity ranged between 116.00 to 146.00 days with the average of 128.22 days. The cultures IET-28879, IET-28881, IET-28900 and Vivekdhan 86 (NC) were earliest in flowering and maturity. The entries, IET-28890 have recorded maximum days to fifty per cent flowering (114 days) and maturity (146 days). Almost 23 entries were significantly earlier than KPR-1 for days to fifty per cent flowering and maturity. Similarly Khatri *et al.* (2019) [9] and Karim *et al*. (2007) [11] found significant variability in flowering and maturity, respectively. Sheshaiah *et al.* (2018) [13], Shikha *et al.* (2019) [14] noticed significant variability for both parameters.

The plant height varied from 61.00 cm to 98.25 cm with an average value of 78.60 cm recorded in the rice entries studied. The entry IET-28892 (98.25 cm) was tallest followed by IET-28891 (92.63 cm), whereas the entry IET-28899 (61.00 cm) was dwarfest followed by IET-28884 (64.50 cm) and among these entries, seven entries were significantly taller than KPR-1. High plant height is considered as desirable because it gives additional income to grain yield through high straw yield desirable, Similarly variance among the genotypes of rice was found in studies of Sheshaiah *et al.* (2018) [13], Shikha *et al.* (2019) [14] and Khatri *et al.* (2019) [9], this may due to climatic requirements of each genotype are different.

The rice entries varied in number of panicles *per* plant from 6.00 to 8.75 with the mean of 7.20. The entry IET-28880 recorded highest number of panicles *per* plant (8.75) followed by IET-28882 and IET-28897 (8.38), while IET-28894 produced least number of panicles *per* plant (6.00) followed by KPR-1 (6.13). Among the entries, five entries were recorded significantly higher number of panicles *per* plant over KPR-1. Sheshaiah *et al.* (2018) [13], Khatri *et al.* (2019) [9] observed the variability for panicles *per* plant in his studies.

The variation in the panicle length, among the 25 entries ranged from 15.25 to 20.63 cm with the mean value of 17.41 cm. The entry IET-28892 had longest panicle length (20.63) followed by IET-28891 (20.13 cm), whereas IET-28893 (15.25 cm) and IET-28900 (15.50 cm) showed lowest panicle length among the entries studied. Similar findings were also observed by Khatri *et al.* (2019) [9] and Sultana *et al.* (2014) [18]. None of the entry recorded significantly higher panicle length than KPR-1.

The results revealed that yield per hectare for 25 entries ranged between 1398 and 4639 kg/ha, with the mean of 2826.11 kg/ha. The IET-28890 (4639 kg/ha) recorded highest yield per hectare followed by IET-28884 (4037 kg/ha), whereas the entry IET-28881 (1398 kg/ha) recorded lowest yield followed by IET-28900 (1431 kg/ha) and IET-28890 is the only one entry recorded significantly highest grain yield over KPR-1, which recorded almost 11 q. more than the local check KPR-1. Similarly sheshaiah *et al.* (2018) [13] found kiruwana genotype for yield among 35 germplasm, Shikha *et al.* (2019) [14] identified top three genotypes in terms of yield per plant in field under aerobic condition and Khatri *et al.* (2019) [9] found GSR221 and IR94391-131-353-19-B-1-1-1-3 superior yielding genotypes in his studies.

The responses of germplasm lines to blast reaction, used in screening were varied from 2 to 6 for leaf blast and 3 to 9 for neck blast, indicating the germplasm used in the study were diverse in nature. Local check KPR-1 recorded least scores over other entries, whereas the IET-28883, IET-28892, and 28897 recorded highest scores for leaf blast disease, whereas the IET-28880, IET-28881 and IET-28890 recorded highest scores for neck blast disease. The significant variations for leaf blast disease in rice were also noticed Dar *et al.* (2015) [2], Hossain and Hegde (2016) [5], Sabin *et al.* (2016) [12] and Sheshaiah *et al.* (2018) [13] under natural conditions. Hassan *et al.* (2017) [3] and Zewdu *et al.* (2017) [21] reported variations among genotypes under both natural and artificial conditions for leaf blast. Sidhu *et al.* (2021) [16] noticed moderately susceptible to highly susceptible genotypes in his studies both artificial inoculation conditions as well as natural epiphytotic conditions.

The entries IET-28897 recorded least score for brown spot disease and the entries IET- 28886, IET- 28887, IET- 28890, IET- 28893 and IET- 28896 recorded less incidence of leaf folder among the 25 entries. This is less than that of local check KPR-1.

Conclusion

Among 25 evaluated entries, IET-28890 is the only entry recorded significantly highest grain yield, recorded almost 11 q/ha. More than the local check KPR-1. Almost recorded same scores of leaf blast, neck blast, brown spot and less incidence of leaf folder than KPR-1, hence, the entry IET-28890 is best performing and most promising entry under hilly conditions of Karnataka and it has great value in future breeding programme.

Table 1: Analysis of variance of elite early duration cold tolerant cultures under irrigated condition in hills

Source of Variation	Degrees of freedom	Mean Sum of squares					
		Days to 50 % flowering	Days to Maturity	Plant height (cm)	No. of Panicles per plant	Panicle length (cm)	Grain yield (kg/ha)
Replications	1	0.00	0.02	0.72	0.08	3.13	410015.43
Treatments	24	151.37*	143.00*	197.45*	1.12	4.02*	1012092.34*
Error	24	0.42	0.02	15.61	0.57	0.89	77235.80

*- Significant at 5 % probability

Table 2: Comparative performance of elite early duration cold tolerant cultures under irrigated condition in hills

Sl. No.	Entries	Growth parameters			Yield parameters			Disease & Pest reaction			
		Days to 50% Flowering	Days to Maturity	Pl. height (cm)	Panicles per plant	Panicle length (cm)	Grain yield Kg/ha.	Leaf blast	Neck blast	Brown spot	Leaf folder
1	IET-28879	80*	116*	72.13	7.63	16.13	2009	3	7	6	25
2	IET-28880	91*	127*	91.38*	8.75*	17.13	1880	5	9	6	10
3	IET-28881	81*	114*	69.63	7.50	16.25	1398	3	9	6	15
4	IET-28882	100*	136*	72.88	8.38*	17.25	2810	5	5	6	20
5	IET-28883	92*	124*	91.25*	6.88	16.50	2560	6	7	9	15
6	Shalimar Rice-3 (ZC)	97*	132*	84.00	7.00	16.38	3106	5	7	8	10
7	IET-28884	105*	138*	64.50	7.00	17.63	4037	3	3	6	13
8	IET-28885	87*	124*	73.13	7.25	16.38	2588	5	7	8	15
9	IET-28886	99*	130*	65.50	6.75	18.25	2542	5	7	7	8
10	IET-28887	90*	125*	78.00	6.75	15.63	3264	4	7	6	8
11	IET-28888	89*	124*	86.00*	6.75	18.75	2574	5	7	8	18
12	IET-28889	92*	126*	89.38*	7.38	17.63	3069	3	5	6	13
13	IET-28890	114	146	70.75	7.38	18.88	4639*	3	3	6	8
14	Vivekdhan 86 (NC)	84*	117*	76.25	8.25*	17.25	2917	4	7	7	18
15	IET-28891	98*	136*	92.63*	6.25	20.13	3106	5	5	7	13
16	IET-28892	89*	124*	98.25*	6.25	20.63	2532	6	5	7	10
17	IET-28893	97*	133*	79.63	6.63	15.25	3023	5	7	6	8
18	IET-28894	93*	128*	84.88*	6.00	18.00	2861	4	7	6	13
19	IET-28895	101*	134*	73.25	7.50	18.00	3319	4	7	7	13
20	IET-28896	91*	124*	83.25	8.00*	17.38	2764	4	7	8	8
21	IET-28897	97*	130*	81.38	8.38*	16.38	2495	6	5	4	10
22	IET-28898	86*	120*	84.63	6.50	17.25	3037	4	7	6	13
23	IET-28899	105*	137*	61.00	7.25	16.88	3134	5	5	8	15
24	IET-28900	81*	117*	64.75	7.50	15.50	1431	4	9	7	18
25	LC-KPR-1	109	144	76.63	6.13	19.88	3556	2	3	6	20
Range		80-114	116-146	61.00-98.25	6.00-8.75	15.25-20.63	1398-4639				
Mean		93.68	128.22	78.60	7.20	17.41	2826.11				
CD (0.05)		1.33	0.292	8.155	1.558	1.945	573.585				
CV (%)		0.69	0.11	5.03	10.48	5.41	9.83				
SEm±		0.456	0.100	2.794	0.534	0.666	196.514				

References

1. Chandramohan Y, Srinivas B, Thippeswamy S, Padmaja D. Diversity and variability analysis for yield parameters in rice (*Oryza sativa* L.) genotypes Indian J Agril. Res 2016;50(6):609-613.
2. Dar SH, Rather AG, Najeeb S, Ahangar MA. Screening of rice germplasm against blast disease under temperate conditions. Mol. Plant Breed 2015;6(13):1-4.
3. Hassan IO, Ragab AI, Soliman MH, El-Shafey RA, El-Assal SES. Genetic improvement of rice resistance to blast and bakanae diseases using mutation induction. Biosci. Res 2017;14(2):246-256.
4. Hosagoudar GN, Amadabade J. Evaluation of rice genotypes for leaf blast reaction, yield and yield attributing traits. Journal of Farm Sciences 2017;30(3):382-386.
5. Hossain MM, Hegde HR. Screening of rice germplasm against *Pyricularia oryzae* the cause agent of rice blast fungus in upland areas. Environment and Ecology 2016;34(1):8-11.
6. https://www.mapsofindia.com/answers/states/which-state-is-the-biggest-rice-producer-in-india/
7. http://ricepedia.org/challenges/food-security
8. IRRI. Standard evaluation system for rice. 4th Edition, IRRI, Philippines 1996.
9. Khatri N, Tiwari DN, Bista M, Pant KR. Evaluation of irrigated rice genotypes for agronomical traits under western terai region of Nepal. Advances in Plants and Agricultural Research 2019;9(3):377-382.
10. Keneni G, Bekele E, Imtiaz M, Dagne K. Genetic vulnerability of modern crop cultivars: causes, mechanism and remedies. International Journal Plant Research 2012;2:69-79.
11. Karim D, Sarkar U, Siddique MNA, Miah MAK, Hasnat MZ. Variability and genetic parameter analysis in aromatic rice. Int. J Sustain. Crop Prod 2007;2(5):15-18.
12. Sabin K, Bijay S, Amrit B, Raman GD, Bhuwan S, Priyanka N *et al*., Screening of different rice genotypes against (*Pyricularia grisea*) Sacc. In natural epidemic condition at seedling stage in Chitwan, Nepal. Advances in Crop Sci. and Tech 2016;4(4):2-6.
13. Sheshaiah, Dushyantha Kumar BM, Gangaprasad S, Gowda TH, Hosagoudar GN, Shashidhar HE. Assessment of rice germplasm lines for leaf blast resistance and yield related parameters under blast hot

spot locality. Journal of Pharmacognosy and Phytochemistry 2018;7(5):3102-3106.
14. Shikha D, Vinodkumar J, Shashidhar HE, Vijayakumar Swamy HV. Phenotypic and genotypic characterization of Rice (*Oryza sativa* L.) genotypes for root morphology and yield under drought stress. Research Journal of Biotechnolog 2019;14(9):53-63.
15. Shrestha J, Subedi S, Kushwaha UKS, Maharjan B. Evaluation of rice genotypes for growth, yield and yield components. Journal of Agriculture and Natural Resources 2021;4(2):339-346.
16. Sidhu PS, Sidhu N, Upmanyu S, Gill RS. Screening of aromatic rice genotypes for resistance against bacterial blight and neck blast diseases. Journal of Pharmacognosy and Phytochemistry 2021;10(1):307-311.
17. Srujana G, Suresh BG, Lavanya GR, Ram BJ, Sumanth V. Studies on genetic variability, heritability and genetic advance for yield and quality components in rice (*Oryza sativa* L.). J Pharmacognosy and Phytochemistry 2017;6(4):564-566.
18. Sultana T, Islam R, Md. Chowdhury SN, Md. Islam S, Md. Hossain E, Md. Islam M. Performance evaluation of two rice varieties under different levels of Nacl salinity stress. Bangladesh Research Publication Journal 2014;10(2):186-195.
19. Vijaykumar, Navinkumar, Suresh BG. Systematic Evaluation of exotic rice germplasm for yield component characters and its grain yield. Int. J Res. Studies in Biosci 2015;3(3):53-56.
20. Wouw VDM, Hintum VT, Kik C, Van Treuren R, Visser B. Genetic diversity trends in twentieth century crop cultivars: A meta analysis. Theory and Applied Genetics 2010;120(6):1241-52.
21. Zewdu Z, Gibson P, Lamo J, Edema R. Reaction of introduced Korean rice genotypes for resistance to rice blast in Uganda. J Plant Breed and Crop Sci 2017;9(7):98-105.