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RESEARCH ARTICLE

FLORAL CHARACTERISTICS IN SUSTAINABILITY OF UPLAND RAINFED RICE (*ORYZA SATIVA* L.)

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ABSTRACT

The present experiment was undertaken in *Kharif* 2013 at Upland Rice Research Block of S. G. College and Research Station, Jagdalpur to investigate the role of floral behavior on yield physiology of upland rainfed rice. Spikelet fertility is found to be positively linked with prolonged vegetative growth (0.0255) because of ample supply of food material. Plant height was observed to be very important in operating grain yield via panicle length (0.2518), spikelet per panicle (0.2821*), spikelet fertility (0.5058**) and biological yield (0.3972**). Grain yield was positively and significantly associated with total crop biomass (0.6669**), plant height (0.5059**). Days to 50 percent flowering was positively associated with crop duration (0.7451***) but exhibited negative inheritance with grain yield (-0.1941) which may pertain to post anthesis stress. Summarily, floral biology should be emphasized while designing crop breeding experiment and genotypes exhibiting positive inheritance among these traits with grain yield must be opted to precede rainfed rice research.

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INTRODUCTION

Upland rice ecology is much harsh environment for rice production where intermittent moisture deficit is the major constraint (Kumar *et al*., 2015a) and cause a yield penalty from 12 to 46 per cent (Oak *et al*., 2006). Upland rice grows under a wide range of conditions from shifting cultivation in Malaysia, the Philippines, West Africa, and Peru, to highly mechanized systems in parts of Latin America. Soil types vary: infertile acid sand in West Africa; oxisol in the Llanos Orintales region of South America; fertile acid soil formed from volcanic tuff in the Philippines; saline soil in coastal areas of India. Most upland rice are of the tall, lodging-susceptible, low-tillering type. They are either bred specifically for upland cultivation or selected locally on the basis of performance under poor moisture conditions. In India, It is grown with little or no fertilizer input with direct seeded methodology in moisture deficit unsaturated soils. Further, poor ability of varieties to produce economic quantity of grain, due to the concomitant poor panicle yield, caused by varying degrees of water stress, makes rice production risky and unattractive due to low yield of 1 to 2 tones/hectare (Atlin *et al*., 2006; Kumar *et al*., 2015b). Therefore, genetic management strategies should be undertaken for cultivating rice with less water and maximizing extraction of soil moisture and its efficient use in crop establishment and growth to enhance biomass and yield.

The experiment was undertaken with 18 genotypes under rainfed conditions during *Kharif* 2013 S. G. College of Agriculture and Research Station, Jagdalpur, IGKV, Raipur, Chhattisgarh. An upland ecology simulation model was created by choosing experimental plot where no water accumulates and cent percent rainfed treatment was given during entire life cycle of crop. Bireplicated sowing was completed June second fortnight by direct seeding in agronomically standardized geometry in 10sq M plot. The data was recorded for 10 quantitative characters namely days to flowering, crop duration, plant height, and panicles per sq M, panicle length, spikelets per panicle, spikelet fertility, grain yield, biological yield and harvest index. The mean over replication of each character were subjected to statistical analysis. Pearson's correlation coefficients were calculated and data was analyzed using unweighted paired group method using cetroids. For statistical analysis software Window State Version 9.1 was used. In present experiment, as per hypothesis, days to flowering was found to be negatively associated with grain yield (Table. 01) (-0.1941) owing to post reproductive drought. In contrast to irrigated rice where it has positive association with grain yield due to availability of lengthy preflowering span however; in

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Table 1. Association analysis in Rainfed rice

Character	Days to Flowering	Crop Duration	Plant Height (cm)	Panicles Per M²	Panicle Length (cm)	Spikelets Per Panicle	Spikelet Fertility (%)	Biological Yield (kg/Plot)	Harvest Index (%)
Days to Flowering	1.0000	0.7451***	-0.0048	0.1265	-0.0772	-0.0573	0.1242	0.0023	-0.2811
Crop Duration	0.7451***	1.0000	-0.1247	0.0099	0.0009	0.0668	-0.0255	-0.1632	-0.1761
Plant Height (cm)	-0.0048	-0.1247	1.0000	0.2231	0.2518	0.2821	0.5058**	0.3972*	0.0529
Panicles Per M²	0.1265	0.0099	0.2231	1.0000	-0.0303	-0.0290	0.2531	0.2655	-0.2872
Panicle Length (cm)	-0.0772	0.0009	0.2518	-0.0303	1.0000	0.9879***	0.1479	0.1614	-0.0509
Spikelets Per Panicle	-0.0573	0.0668	0.2821	-0.0290	0.9879***	1.0000	0.1644	0.1466	-0.0420
Spikelet Fertility (%)	0.1242	-0.0255	0.5058**	0.2531	0.1479	0.1644	1.0000	0.0327	-0.0121
Biological Yield (kg/Plot)	0.0023	-0.1632	0.3972*	0.2655	0.1614	0.1466	0.0327	1.0000	-0.5182**
Harvest Index (%)	-0.2811	-0.1761	0.0529	-0.2872	-0.0509	-0.0420	-0.0121	-0.5182**	1.0000
Grain Yield (kg/Plot)	-0.1941	-0.2971	0.5059***	0.0313	0.1872	0.1780	0.0391	0.6669***	0.2628
Significance level	0.05	0.01	0.005	0.001					
If Correlation r =>	0.3291	0.4237	0.4577	0.5253					

rainfed ecology biased selection for earliness the association turns negative. Spikelet fertility is found to be positively linked with prolonged vegetative growth (0.0255) because of ample supply of food material. Plant height was observed to be very important in operating grain yield via panicle length (0.2518), spikelet per panicle (0.2821*), spikelet fertility (0.5058**) and biological yield (0.3972**) (Kumar *et al*., 2014). Greater plant height improves panicle productivity and produce deep root system which aids in moisture interrupt survival. Spikelet fertility recorded positive association with days to flowering (0.1242), plant height (0.5058**) and spikelets per panicle (0.1644). Grain yield was positively and significantly associated with total crop biomass (0.6669**), plant height (0.5059**). Similar observation was recorded by Kumar *et al*., (2014 and 2015b) for yield associated traits under water stress environments in sunflower (*Helianthus annuus* L.) and Rice (*Oryza sativa* L.) respectively. Information on inter association of yield components showed nature and extent of their relationship with each other. This will help in simultaneous improvement of different characters along with yield in breeding programmes. Harvest index (HI), measurement of photosynthetic efficiency of genotypes, is among the critical parameters for upland rice breeding. Higher HI estimates assures the linear partition of carbon assimilates to panicles (Chakraborty and Chakraborty, 2010). As per theoretical background, HI was found to have negative relationship with days to flowering and crop biomass since prolonged vegetative phase cause the crop suffers from monsoon switch drought. In rainfed scenario it's mandatory to opt for genotypes which have discriminate formation and translocation of carbohydrate. Terminal or reproductive drought is the most injurious to grain yield (Xangsayasane *et al*., 2014) whereas plants may recover from early and vegetative drought later in the growing season. Therefore, floral parameters like days to 50 percent flowering, spikelet per panicle and spikelet fertility is key for upland research where monsoon switches of by second fortnight of September hence, crop must attain grain yield level prior soil moisture begins to exhaust (Kumar *et al*., 2016). Late season water stress cause reduction in spikelet count and spikelet sterility which eventually reduces the grain yield. Hence based on present study it is concluded that floral biology should be given utmost importance while designing crop breeding experiment and genotypes exhibiting positive trend among these traits with grain yield must be opted to proceed rainfed rice research.

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