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Effect of herbicide on rice biomass and seed production under direct seeded rice condition

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Abstract
An experiment was conducted at the College farm, College of Agriculture, during Kharif, 2022-2023 in order to assess selected varieties for biomass phenotypical observations and seed production during kharif. The study aimed to analyse the growth of the rice in terms of Number of Panicles, Number of Grains, and Test weight. Plant behavioural trait of diminishing growth towards the end of the growing season was noted in all the varieties. An overview of the leaf area measured indicated that in all Entry#2, Entry#4 and Entry #5 leaf area increased at an increasing rate up to harvest, at a diminishing rate from 60 to 90 DAS, and thereafter decreased towards maturity. The number of tillers in plant increased up to 60 DAS and thereafter decreased as the crop reached maturity.

Keywords: *kharif*, phenotypical observations, panicles, Grains

Introduction
Rice is a cereal grain, and in its domesticated form is the staple food for over half of the world's human population, particularly in Asia and Africa. Rice is the seed of the grass species *Oryza sativa* (Asian rice) or, much less commonly, *O. glaberrima* (African rice). Asian rice was domesticated in China some 13,500 to 8,200 years ago, while African rice was domesticated in Africa some 3,000 years ago. Rice has become common place in many cultures worldwide; in 2021, 787 million tons were produced, placing it fourth after sugarcane, maize, and wheat. Only some 8% of rice is traded internationally. China, India, and Indonesia are the largest consumers of rice. A substantial amount of the rice produced in developing nations is lost after harvest through factors such as poor transport and storage. Rice yields can be reduced by pests including insects, rodents, and birds, as well as by weeds, and by diseases such as rice blast. Traditional polycultures such as rice-duck farming, and modern integrated pest management seek to control damage from pests in a sustainable way.

Rice is commonly cultivated in Asia by transplanting one-month-old seedlings into puddles of constantly saturated soil. Because frequent puddling damages soil aggregates, lowers permeability in subsurface layers, and generates hard-pans at shallow depths, the succeeding non-rice upland crop in the cycle may suffer. Excess conveying of water for puddling during the warmest months of summer causes a drop in the water table and bad quality water for agriculture in the North West Indo-Gangetic Plain (IGP). While in the eastern IGP, rice transplanting is mainly reliant on monsoon rainfall and is one to three weeks postponed due to the conventional practice of puddling with ponded water (Rao *et al*., 2007) [4]. Farmers are therefore altering either their rice cultivation techniques (transplant to directly sowing in puddle soil) [Wet-DSR]) or tillage practices or both (puddle transferring to un puddled soil dry direct seeding). Three common procedures puddling, which compacts soil to decrease water seepage, transplanting, and standing water are avoided by direct sowing. (Rao *et al*., 2007) [4].

Materials and Methods
The experiment was conducted during rainy (kharif) season in field at Singhania University in Jhunjhunu district (22°57' E, 88°20' N; 9.75 m above mean sea-level) of Rajasthan (lower Gangetic alluvial plains).

Five different varieties i.e., SWARNA, DHANI, KOSHIKARI, 6444GOLD, MTU1010 (Entry#1, Entry2, Entry#3, Entry#4, Entry#5). The minimum Vegetation was occurred at 6444Gold variety with the application of Pursuit/imazethapyr herbicide was used at

400ml/acre and the specific area for research is 0.8 length x 0.3 width = 0.24 meter square and used quantity was 1ml/10 metre square. When we use the herbicide as per litres, we get the calculations per volume of water.
3grms/L = Altrogen
0.5/L = laudis
2.5ml/L= mero

The treatments include:
Treatment 1= UTC,
Treatment 2= 0.024 ml= 24ul,
Treatment 3= 0.048ml= 48ul,
Treatment 4= 0.072ml = 72ul

After the spray, the yield parameters are observed in the entries and all the replications. Observations were made on various attributes, including plant height, plant spread, number of primary branches per plant, stem girth, days to first flower bud appearance, days to first flower opening, days to 50% flowering, flowering duration, fresh weight of flower, shelf life, diameter of flower, carotenoid content, number of flowers per plant and yield per plot. To facilitate this, five plants were randomly chosen from each replication for data collection. Look at the pictures in the (#table1).

Table 1: Skeleton of ANOVA table

Source of variation	df	SS	MSS	F Cal.	F Tab. at at 5%
Due to replications	r-1	RSS	RSS/ (r-1)	MRSS MESE	
Due to treatments	t-1	Tr.SS	TSS/ (t-1)	MTSS MESS	
Due to error	(r-1)(t-1)	ESS	ESS/(r-1) (t-1)		
Total	(rt-1)	TSS			

Standard error of mean (SEm±)
Standard Error of mean was calculated by the following formula:

Standard Error of mean = √ESS/r or $\frac{\sqrt{\sigma 2}}{r}$

S.E. difference mean = $\sqrt{2}(\frac{ESS}{r})$

Where,
r = Number of replications

Co-efficient of variation (CV)
It is defined as the ratio of the standard deviation to the mean expressed in percentage.

C.V(%) = σ/x ×100 ¯

Critical difference (CD)
To estimate, whether there is a significant difference between two treatments means for each of the character CD at 5 percent level of significance was calculated as:

C.D = S.E. difference mean × $t_{0.05}$ (error DF)

Results and Discussion
Number of panicles per plant
The highest panicles per plant were recorded in Entry #5 variety at 100 DAS with mean of 7.00 in treatment 7 over control Enlarging the sink capacity through increase in spikelet's per panicle has become an important strategy in current high-yielding breeding programs and cultivation practices (Peng *et al*. 2008) [24]. Stated that there was a negative correlation between the number of spikelet's per panicle and the filled-grain percentage. Reported that large-panicle japonica/indica hybrids with high grain filling could be developed through the selection of suitable parent materials. In our study, both Yong you 1540 and Yong you 4540 (HF) exhibited approximately 350 spikelet's per panicle, which is obviously higher than that of the conventional varieties (100-200) in production. Meanwhile, the filled grain percentage (%) of Yong you 1540 and Yong you 4540were both approximately 90. These results indicate that it is possible to develop large-panicle varieties with high filled-grain percentage. Table #1

Table 1: Number of panicles per plant

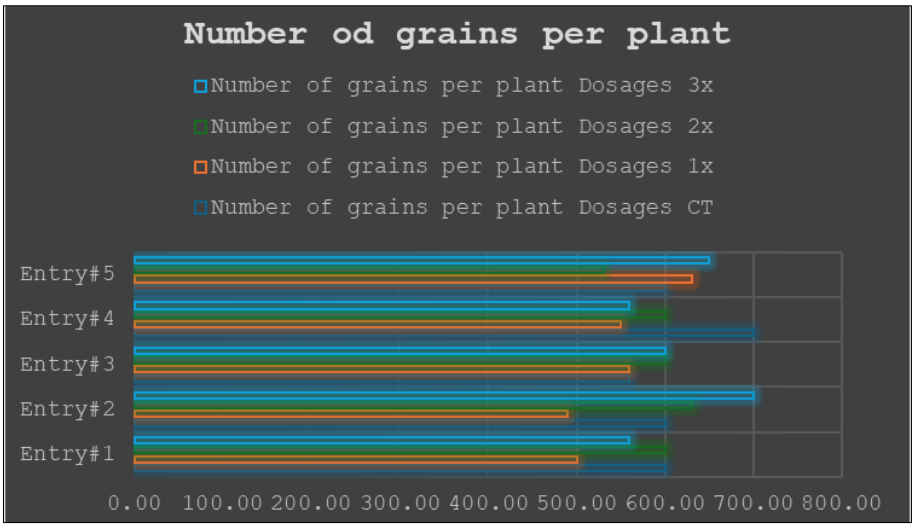
S. No.	Treatments	Entry #1	Entry #2	Entry #3	Entry #4	Entry #5
1	Treatment 1	5.00	6.00	5.67	5.00	6.33
2	Treatment 2	6.33	5.67	6.67	6.00	5.67
3	Treatment 3	6.33	7.00	6.33	6.00	7.00
4	Control	6.00	5.67	5.67	6.00	6.00
	F test	S	S	S	S	S
	S.Em (±)	0.2	4.3	0.5	0.3	0.4
	CD(5%)	0.8	13.4	1.6	0.9	1.2

Number of grains per plant
Significant effect was observed by the statistical analysis of number of grains/panicles. Treatment 3x effective yield shown in Entry #2 1.5kg recorded significant and highest number of panicles/panicles (2.09). However, 2kg were found to be statistically with 1.5kg with Entry #4.
The effect of herbicide might not be improvement in the physical condition of soil as well as increased availability of plant nutrients, which results increasing grains/panicles.
The availability and optimum regular supply of plant nutrients might have favorably influenced the flowering and grain formation which ultimately increased panicles/plant. Those results are in conformity with those of Movalia *et al*. (2018).

Table 2: Number of grains per plant

Treatments	Dosages			
	CT	1x	2x	3x
Entry#1	600.00	500.00	600.00	560.00
Entry#2	600.00	490.00	630.00	700.00
Entry#3	560.00	560.00	600.00	600.00
Entry#4	700.00	550.00	600.00	560.00
Entry#5	600.00	630	530	650

Table 3: Graphical representation of the grains per plant



Conclusion

From the observations made in the study, it can be concluded that amongst all the varieties. Entry#5 were the best in terms of panicles and Entry #2 and Entry#4 for seeds. Thus Entry #2 Entry #5 are the best lines that can be recommended for direct seeded conditions. Rice lines with high biomass and seed yield and are also found to be remunerative.

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