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Impact of different seed rates and knockdown days of sesbania on drymatter production in direct seeded rice

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Abstract
Field experiment was conducted during *kharif* season of 2020-21 at Agricultural College Farm, Bapatla to assess the impact of different seed rates and knockdown days of sesbania on drymatter production at different growth stages in direct seeded rice. The experiment was laid out in split plot design, the main plot treatments includes brown manure species dhaincha (Sesbania aculeata) sown at three seed rates (20, 30 and 40 kg ha^{-1}) and sub plot treatments comprising knockdown of dhaincha at four stages (20, 25, 30 and 35 DAS) using 2,4-D at 0.5 kg ha^{-1}. At 30 DAS, maximum drymatter production in rice was associated with the dhaincha seed rate @ 20 Kg ha^{-1}. At 60, 90, 120 DAS and at harvest it was recorded with the dhaincha seed rate @ 40 Kg ha^{-1}. Among the sub plots, at 30 DAS of rice maximum drymatter production was registered by killing sesbania at 20 days. While at 60 DAS, 90 DAS, 120 DAS and at harvest of rice the higher values of drymatter accumulation in rice was recorded with knockdown of dhaincha at 30 days. The interaction of main and sub plots was significant at 90 DAS of rice. The growing of sesbania with 40 kg seeds ha^{-1} along with its knockdown at 30 days was seen best to maximize the drymatter accumulation having better performance of rice over other interactions.

Keywords: Rice, sesbania, brown manuring, seed rates, knockdown

Introduction

Rice (*Oryza sativa* L.) is the principle source of the food for more than half of the world's population who depends for their daily sustenance (Sanodiya and Singh., 2018) [5]. India is the second largest producer and consumer of rice in the world which occupies an area of 43.79 m.ha with the total production and productivity of 112.91 m.t. and 2.57 t ha^{-1} respectively, (www.indiastat.com 2019-20). Rice is mainly cultivated by transplanting in puddle field, which results in the formation of hard pan and damages soil structure, though it helps in retention of more water and effective in weed control, but this needs more time, labour and energy. Farmers are keen to adopt direct seeded rice instead of transplanted rice as there is acute shortage of labour and sky rocketing wages of labourers at the time of transplanting. It is suggested that alternate method of planting *i.e.* dry-direct seeded rice is gaining popularity regarding its high water use, labor use and energy use efficiencies (Singh *et al*., 2009) [7]. With the advent of resource conserving technologies, direct seeding is being emerged as a viable alternative to transplanted rice (Tripathi *et al*., 2004) [8].

Dhaincha (*Sesbania aculeata*) is considered ideal green manure crop due to its wider adaptability to varying conditions of soil and climate. It can be grown even under adverse conditions of drought, waterlogging, salinity etc. Green manuring practice faces a great pull back due to limited water availability in reservoirs during peak summers. Brown manuring can be a climate-resilient/smart agro-practice with plethora of benefits (Oyeogbe *et al*., 2017) [4]. In addition this can offer residual effect on soil organic matter, weed, N and C reserves, and soil physical properties, leading to greater benefit in rice crop. The atmospheric nitrogen fixation and facilitation of crop emergence in areas of soil crust formation are other benefits of this technique in addition to weed suppression (Singh *et al*., 2009) [7]. It helps in adding about 15 kg N ha^{-1} along with smothering of weeds and conserving moisture (Gaire *et al*., 2013) [2]. Interference by *Sesbania* plants at initial stage (0-35 DAS) may affect rice population, growth and yield, which needs proper optimization through *Sesbania* seed rate and time of 2,4-D application for higher rice-*Sesbania* balance. Thus, the major part is to evaluate its impact on the performance of dry direct seeded rice through this experiment.

Materials and Methods

The experiment was laid out in a split plot design on clay loam soils of Agricultural College Farm, Bapatla with 12 treatments during *kharif* 2020-21. Each treatment was replicated thrice and were randomized as per procedure given by Cochran and Cox (1957) [1]. The main plot treatments includes brown manure species dhaincha (*Sesbania aculeata*) sown at three seed rates (20, 30 and 40 kg ha^{-1}) and sub plot treatments comprising knockdown of dhaincha at four stages (20, 25, 30 and 35 DAS)

Recommended seed rate of 50 kg ha^{-1} of direct sown rice was adopted for sowing. The seeding of rice in experimental plots were followed using line markers making furrows at a row spacing of 20 cm and placing the seeds were sown in furrows at a seed to seed spacing of 10 cm and then covered with loose soil to facilitate easy germination. *Sesbania* was grown as co-culture with direct sown rice for brown manuring. Its seeds at three rates (20, 30 and 40 kg ha^{-1}) as per the treatments were broadcasted manually all through the respective plots after sowing of rice in rows and allowed to grow with rice crop. Application of 2,4-D at 0.5 kg ha^{-1} was done uniformly at 20, 25, 30 and 35 DAS by using a knapsack sprayer @ 500 l ha^{-1} of spray fluid to knockdown dhaincha as per the respective treatments in the experimental plots which resulted in gradual killing of *Sesbania* plants. The recommended dose of fertilizer @ 120:60:40 (N-P_2O_5-K_2O) kg ha^{-1} was applied through Urea, single superphosphate and muriate of potash, respectively. Five successive hills from the second border row were cut from the ground level at 30, 60, 90 days, 120 DAS and at harvest. Initially the collected plant biomass was shade dried and later oven dried at 60 ^{0}C till a constant weight was obtained. Sample dry weights were recorded and summed up, to arrive at mean dry matter hill^{-1} from individual treatments. The mean dry weights were multiplied with number of hills m^{-2} and expressed in kg ha^{-1}.

Results and Discussion

Data pertaining to drymatter accumulation of direct seeded rice at 30, 60, 90 DAS and at harvest (Table 1) revealed that seed rates and knockdown of dhaincha had a significant effect on drymatter accumulation whereas, their interaction was significant at 90 DAS (Table 2). The data also indicated that drymatter accumulation gradually increased with the duration of the crop. Maximum drymatter accumulation was observed at the time of harvest.

Table 1: Drymatter production (Kg ha^{-1}) at different growth stages of rice as influenced by seed rates and timing of knockdown of dhaincha in rice during *kharif*, 2020-21

Treatments	Drymatter production (Kg ha^{-1})				
	30 DAS	60 DAS	90 DAS	120 DAS	At harvest
Seed rate of dhaincha (M)					
M_1- Seed rate of dhaincha @20 Kg ha^{-1}	549	1578	4820	9468	11886
M_2- Seed rate of dhaincha @30 Kg ha^{-1}	532	1712	5631	10421	12798
M_3- Seed rate of dhaincha @40 Kg ha^{-1}	527	2007	6426	11677	13840
S.Em±	5.5	38.1	157.8	251.4	263.5
CD (p = 0.05)	19	131	540	870	909
CV (%)	10.0	10.9	9.2	11.3	12.0
Timing of knockdown of dhaincha (S)					
S_1- Brown manuring at 20 DAS	555	1596	4807	9450	11795
S_2- Brown manuring at 25 DAS	541	1786	5751	10597	12775
S_3- Brown manuring at 30 DAS	532	1996	6420	11646	13753
S_4- Brown manuring at 35 DAS	518	1685	5526	10393	12709
S.Em±	7.0	28.0	134.1	270.3	306.0
CD (p = 0.05)	21	87	416	784	912
CV (%)	8.9	11.2	7.7	10.0	11.7
Interaction	NS	NS	S	NS	NS

At 30 DAS, significantly highest drymatter accumulation was observed with the seed rate @ 20 Kg ha^{-1} (549 Kg ha^{-1}) which was significantly superior to seed rate @ 40 Kg ha^{-1} and was on par with 30 Kg ha^{-1}. Significantly the lowest drymatter accumulation was registered with the seed rate @ 40 Kg ha^{-1} treatment (527 kg ha^{-1}). At 60 DAS, seed rate @ 40 Kg ha^{-1} recorded maximum drymatter accumulation (2007 kg ha^{-1}) which was found significantly superior to other seed rates. Significantly the least drymatter accumulation was observed with @ 20 Kg ha^{-1} (1578 kg ha^{-1})

At 90, 120 DAS and at harvest, seed rate @ 40 Kg ha^{-1} recorded significantly higher drymatter (6426, 11677, 13840 kg ha^{-1}) over M_2 and M_1 treatments. Significantly the lowest drymatter accumulation was observed with seed rate @ 20 Kg ha^{-1} (4820, 9468, 11886 kg ha^{-1} during 2020-21, 2021-22 and in pooled data, respectively).

At 30 DAS, significantly the highest drymatter accumulation was recorded when dhaincha was knocked down at 20 days (555 kg ha^{-1}) which was however comparable with 25 days of knocking down (541 kg ha^{-1}). The lowest drymatter accumulation was recorded in brown manuring at 35 days (518 kg ha^{-1}). However, this treatment was statistically comparable with brown manuring at 30 days.

At 60 DAS, significantly the highest drymatter accumulation (1996 kg ha^{-1}) was observed in S_3 treatment. Significantly the lowest drymatter accumulation was recorded in 20 days of knocking down (1596 kg ha^{-1}). S_3 and S_4 treatments were comparable with one another. At 90, 120 DAS and at harvest significantly highest drymatter accumulation was recorded with the BM at 30 days (6420, 11646, 13753 kg ha^{-1}) which was significantly superior to BM at 25, 35 and 20 days of knockdown and significantly lowest drymatter accumulation was recorded with 20 days of brown manuring (4807, 9450, 11795 kg ha^{-1}). It was also observed that S_2 and S_4 treatments were statistically on a par with one another.

Maximum dry matter was recorded with BM at 30 days at all the stages except at 30 DAS of rice. The availability of sufficient amount of nutrients might have induced vegetative growth leading to better interception of photosynthetically active radiation which produced more photosynthates resulting in taller plants and more number of tillers which ultimately led to higher accumulation of dry matter in leaves and stem at early growth stages and better translocation to sink during later stages. It was also observed that brown manuring at 30 days was better than brown manuring at 35 days. It was because delayed 2, 4-D application resulted in higher weed density as they got more time to grow in number as well as in size. Also as dhaincha grew older, they competed with the crop as well as the weeds. Thus, giving rise to severe competition for the resources which might have led to lesser accumulation of drymatter by rice. This is in agreement with the findings of Gill and Wallia (2014) [3] and Sarangi *et al*. (2016) [6].

Table 2: Interaction between seed rate and timing of knockdown of dhaincha on drymatter production (kg ha^{-1}) at 90 DAS in rice during *kharif,* 2020-21.

	Drymatter production (kg ha^{-1}) at 90 DAS				
Treatments	**S_1**	**S_2**	**S_3**	**S_4**	**Mean**
M_1	4033	4360	6000	4890	4820
M_2	4433	6126	6200	5766	5631
M_3	5954	6766	7061	5922	6426
Mean	4807	5751	6420	5526	
	S.Em (±)	CD (p=0.05)	CV (%)		
Main plot	157.8	540	9.2		
Sub plot	134.1	416	7.7		
MXS	289.3	868			
SXM	298.4	955			

The interaction effect of seed rates and timing of knockdown of dhaincha (Table 2) was significant with drymatter accumulation at 90 DAS, seed rate @ 40 Kg ha^{-1} along with brown manuring at 30 DAS registered highest drymatter accumulation (7061 kg ha^{-1}) and found significantly superior to rest of interactions except knocking down at 25 days at same seed rate. While, drymatter accumulation was minimum with the seed rate @ 20 kg ha^{-1} and knockdown of dhaincha at 20 days and was on par with the seed rate @ 30 kg ha^{-1} at same knockdown stage. BM at 20 days was on par with the BM at 25 days at the same seed rate @ 20 kg ha^{-1} during both the years of study and in pooled data.

Conclusion

From the results of the present investigation the following conclusion were drawn. It was observed that seed rate @ 40 kg ha^{-1} was found to be more efficient in registering drymatter accumulation. Among the different knockdown days of dhaincha tested, brown manuring at 30 DAS registered higher drymatter production.

References

1. Cochran WG, Cox GM. Experimental design. 2nd Edition, John Wiley and Sons, New York, 1957, 615.
2. Gaire R, Dahal KR, Amgain LP. Effect of different mulching materials on weed dynamics and yield of direct seeded rice in Chitwan, Nepal. Agronomy Journal of Nepal. 2013;3:73-81
3. Gill JS, Walia SS. Effect of establishment methods and nitrogen levels on basmati rice (*Oryza sativa*). Indian Journal Agronomy. 2014;58(4):506-511
4. Oyeogbe AI, Das TK, Bhatia A, Singh SB. Adaptive nitrogen and integrated weed management in conservation agriculture: impacts on agronomic productivity, greenhouse gas emissions, and herbicide residues. Environmental Monitoring Assessment. 2017;189(4):198.
5. Sanodiya P, Singh MK. Effect of live mulches, cover crops and herbicides on weed flora, growth and yield of direct seeded rice (*Oryza sativa*). Indian Journal of Agronomy. 2018;63(1):60-66.
6. Sarangi DR, Sahoo TR, Sethy S, Chourasia M, Prasad SM, Mohanta RK *et al*., Effect of replacing a part of nitrogenous fertilizer by brown manuring in direct seeded rice: a field study. *Oryza*. 2016;52(2):226-228.
7. Singh RP, Singh PK, Singh AK. Effect of green manuring on physico-chemical properties of soil and productivity of rice. *Oryza*. 2009;46(2):120-123.
8. Tripathi SB, Hazra CR. Forage productivity of winter maize under legume covers as influenced by Nitrogen fertilization. Forage Research. 2004;28(2):55-58.
9. www.indiastat.com 2019-20.