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Studies on the effect of stale seedbed technique and herbicides in transplanted rice

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Abstract
Field investigation was carried out at Annamalai University Experimental Farm, Annamalai Nagar, Tamil Nadu during *Late samba* season (September, 2022 - February, 2023) in a randomized block design with nine treatments and replicated thrice. Among the different treatments, Stale seedbed technique fb Hand weeding which is statistically on par with Stale seedbed technique fb Triafamone 20% + ethoxysulfuron 10% WG @ 220 g ha^{-1} at 8 DAT recorded the lower weed count, weed dry matter production and the higher weed control index favouring higher growth attributes and grain yield of rice while maximum nutrient uptake was recorded under weed free check. Higher plant height, dry matter production and higher grain yield were recorded under the treatment Stale seedbed technique fb one hand weeding at 25 DAT practice might be due to maintenance of weed free environment, particularly throughout vital growth stages of crop, cut back crop weed competition helped in higher growth and development leading to higher grain yield.

Keywords: Stale seedbed, triafamone, ethoxysulfuron, rice, grain yield

Introduction
Rice (*Oryza sativa* L.) is the most important and extensively grown crop in tropical and subtropical regions of the world. It is the staple food for over 70 per cent of the world's population and it is extremely important for country's food and livelihood security. In India, rice occupies an area of 46.38 million hectares with a production of 130.29 million tonnes and with a productivity of 2.80 t ha^{-1} (USDA, 2022) [20]. In Tamil Nadu, it is cultivated in an area of 2.21 million hectare with a production of 8.07 Mt and productivity of 3.6 t ha^{-1} (DES, 2021). Weeds compete with crop plants for essential resources such as sunlight, water, and nutrients. This competition can lead to stunted growth of rice and overall lower yield. Singh *et al.* (2018) [17] revealed that yield reduction due to weed growth was found to vary from 28 to 45 per cent in transplanted rice. Hand weeding in transplanted rice is relatively easy, because the seedlings are planted in rows between which the weeder can walk and it was effective but it is labour intensive, tedious, back breaking and does not ensure weed removal at critical stage of crop weed competition (Rao *et al.*, 2019) [14]. It has been found that herbicides in combination with other methods of weed control like physical and cultural result in considerably superior weed control and better grain yield than the sole application due to their broad spectrum and long-lasting weed control (Bhurer *et al.*, 2013) [2]. The "Stale seedbed technique" is a preventive weed control method used in rice cultivation and other crop production systems to manage weeds before planting the main crop. This technique involves creating a seedbed and allowing weed seeds to germinate, then controlling the emerging weeds before sowing the desired crop. The goal is to reduce weed pressure during the early stages of the main crop's growth. Preparing the seedbed in advance and allowing weeds to germinate, farmers can disrupt the weed life cycle and decrease the weed seed bank in the soil. This can lead to reduced competition for nutrients, water, and sunlight once the main crop is planted (Kumar and Ladha, 2011) [7]. The stale seedbed technique should not be viewed as a stand-alone treatment that maintains weed suppression during the entire cropping cycle and thus may often require it be part of an integrated weed management (IWM) programme. Herbicide combinations consisting of two or more herbicides having greater activity on diverse weed flora due to differential modes of action have become

popular in recent years (Dhanapal *et al*., 2018) [4]. The new generation herbicides that are available in the market are essential for better weed control. There is a need to integrate different weed management strategies to achieve effective and sustainable weed control in rice-based cropping systems (Mishra *et al*., 2008) [8].

Materials and Methods

The experiment was carried out at Annamalai University Experimental Farm, Annamalai Nagar, Tamil Nadu during *Late samba* season (September, 2022 - February, 2023). The experimental field was located at 11°24' North latitude and 79°44' East longitude with an altitude of +5.79 m above mean sea level. The crop season recorded a maximum temperature which ranged from 28.2 °C to 35.4 °C with a mean of 30.7 °C. The minimum temperature ranged from 17.4 °C to 26.2 °C with a mean of 21.4 °C. The relative humidity ranged from 68 to 91 per cent with a mean of 79.6 per cent. The crop period received a rain fall of 1221.8 mm distributed over 50 rainy days during crop season. The texture of the experimental field soil was sandy clay loam in with a pH of 7.5. The soil was low in available nitrogen, medium in available phosphorus and high in available potassium. The study used the popular variety BPT 5204. The experiment used randomised block design with nine treatments and three replications.

There were nine treatment, *viz.*, T_1- Unweeded control, T_2- weed free check, T_3- Stale seed bed technique (SSBT) alone, T_4- SSBT followed by One Hand Weeding at 25 DAT,

T_5- SSBT followed by Pretilachlor 6.0%+ pyrazosulfuron ethyl 0.15% GR @ 660 g ha^{-1} at

3 DAT, T_6- SSBT followed by Triafamone 20% + ethoxysulfuron 10% WG @ 220 g ha^{-1} at

8 DAT, T_7- SSBT Followed by 2,4-D sodium salt @ 1560 g ha^{-1} at 35 DAT, T_8- Pretilachlor

6.0% + pyrazosulfuron ethyl 0.15% GR @ 660 g ha^{-1} followed by Hand weeding at 35 DAT, T_9- Pretilachlor 6.0% + pyrazosulfuron ethyl 0.15% GR @ 660 g ha^{-1} Followed by 2,4-D sodium salt @ 1560 g ha^{-1} at 35 DAT. For stale seedbed technique (SSBT) the area should be puddled, levelled and irrigated to allow the weeds to germinate. About 7 to 10 days after the rain or irrigation, perform shallow tillage with hoe to kill the weeds. Again, irrigate the field to germinate weeds. About 7 to 10 days after the rain, perform shallow tillage with a rake or hoe to kill the weeds. Twenty-six days old seedlings were planted @ 2 seedling $hill^{-1}$ with a spacing of 20 cm x 15 cm to accommodate an optimum plant population. Pre-emergence and post emergence of different herbicide mixture was applied with the help of knapsack sprayer fitted with a flood fan nozzle with a spray volume of 500 L ha^{-1} as per treatment schedule. In manual hand weeding and weed control treatments, weeds are uprooted within the row and between the rows using with hand weeding as per days mentioned in each treatment. The weed count was taken from the tagged spot of 0.25 m^2 in the randomly selected each net plot and were calculated and converted into square meter basis for convenience. In order to draw a valid conclusion, the weed count data were subjected to ($\sqrt{X+0.5}$) as suggested by Gomez and Gomez (1984) [6] before statistical analysis.

Results and Discussion

Effect of weed management practices on growth characters

Among the integrated weed management practices, Stale seedbed technique fb one hand weeding at 25 DAT (T_4) was found to be advances in plant height (106.37 cm), number of tillers m^{-2} (425), dry matter accumulation (11991 kg ha^{-1}) and leaf area index (4.9) Which was statistically on par with Stale seedbed technique fb Triafamone 20% + ethoxysulfuron 10% WG @ 220 g ha^{-1}. The treatment stale seedbed technique fb hand weeding records the higher growth attributes this was due to reduction in weed growth at critical crop growth stages by stale seedbed fb one-hand weeding resulting in good aeration and nutrient availability to crop growth. It might be due to overall favourable growth and more photosynthesis. Similar results were reported by Sanbagavalli *et al.* (2010) [15] and Peer *et al*. (2013) [11]. The treatment with Stale seedbed technique fb Triafamone 20% + ethoxysulfuron 10% WG @ 220 g ha^{-1} also produced higher growth characters. Effective weed control by Triafamone + ethoxysulfuron which created weed free environment owing to reduced crop weed competition during critical stages of crop growth resulting in increased availability of growth resources to crop, which in turn resulted in elongation of internodal length. Increase in plant height might be due to better environment by rice due to reduced crop-weed competition. These results are in conformity with those findings of Parthipan *et al.* (2013) [10] and Uma *et al.* (2014) [19]. Effective utilization of resources like water, nutrient, light and space in a conductive crop environment created by reduced weed competition might be the reason for higher dry matter accumulation in this treatment. Increased tiller production might be due to the fact that effective control of weeds by herbicides at initial stage and better environment for crop created by hand weeding at later stages by way of reducing crop-weed competition. These findings are in line with Deivasigamani (2016) [3] and Yadav *et al.* (2019) [21]. Unweeded control resulted in higher nutrient removal by weeds and increased weed dry matter production. Higher nutrient removal by weeds reduced the tiller number and plant height resulting in the lowest dry matter

production of crops under unweeded check. This observation was in accordance with the report of Bhat *et al.* (2017) [1].

Effect of weed management practices on grain yield of rice

Adoption of different weed management practices significantly influenced the grain yield (5529 kg ha^{-1}) of rice. Among the different weed management practices higher grain yield were noticed with Stale seedbed technique fb Hand weeding which was statistically on par with Stale seedbed technique fb Triafamone 20% + ethoxysulfuron 10% WG @ 220 g ha^{-1} at 8 DAT. The increase in grain yield with SSB might be due to significant improvement in dry matter accumulation and higher number of effective tillers that could be due to less competition of weeds. These results were in accordance with findings of Shivram *et al*. (2020) [16]. The lower grain was observed in unweeded control (T_1) plot. This might due to severe crop weed competition from all the resources resulted in poor source and sink development with lesser growth and yield of crop due to higher weed density and biomass. Similar results were also reported by Mohapatra *et al*. (2021) [9] and Pooja and Sarvanane (2021) [12].

Effect of weed management practices on nutrient uptake by rice

Among the weed management practices, weed free check (T_2) was recorded higher uptake of nitrogen (171 kg ha^{-1}), phosphorus (25.34 kg ha^{-1}) and potassium (184 kg ha^{-1}) by rice crop, which was followed by the treatment with the Stale seedbed technique fb Hand weeding (T_4). The better suppression of weeds at early stage favoured the vigorous growth of

seedling, without any crop weed competition enhances plant height, LAI and number of tillers leads to higher DMP of the crop and sustained nutrient availability led to better uptake of N, P and K by the crop. This is in agreement with findings of Prashanthi *et al*. (2017) [13]. In unweeded control plot the plant height, LAI, number of tillers and crop DMP is reduced, it might be due to higher weed count and weed DMP in the field. The increased weed number and weed DMP, reduced the plant height, crop DMP were led to reduced N, P and K uptake by crops. This is line with the findings of Sridevi *et al*. (2015) [18].

Table 1: Effect of weed management practices on growth characters and grain yield of rice

Treatments	Plant height at harvest	Number of tillers m^{-2}	LAI	DMP at Harvest	Grain yield
T_1 - Unweeded control	78.98	321	3.08	7996	3057
T_2 - Weed free check	111.49	438	5.18	12669	5799
T_3 - Stale seedbed technique (SSBT) alone	91.83	389	3.98	9717	4124
T_4 - SSBT followed by One Hand Weeding at 25 DAT	106.37	425	4.9	11991	5529
T_5 - SSBT followed by Pretilachlor 6.0% + pyrazosulfuron ethyl 0.15% GR @ 660 g ha^{-1} at 3 DAT	99.34	407	4.37	11284	5002
T_6 - SSBT followed by Triafamone 20% + ethoxysulfuron 10% WG @ 220 g ha^{-1} at 8 DAT	104.58	419	4.76	11894	5481
T_7 - SSBT Followed by 2,4-D Sodium salt @ 1560 g ha^{-1} at 35 DAT	93.49	395	4.05	10663	4690
T_8 - Pretilachlor 6.0% + pyrazosulfuron ethyl 0.15% GR @ 660 g ha^{-1} followed by Hand weeding at 35 DAT	85.94	372	3.64	9717	4124
T_9 - Pretilachlor 6.0% + pyrazosulfuron ethyl 0.15% GR @ 660 g ha^{-1} followed by 2,4-D Sodium salt @ 1560 g ha^{-1} at 35 DAT	84.06	368	3.56	9375	3964
S.Ed	2.34	5.02	0.12	276.89	124
CD (P=0.05)	4.96	10.65	0.26	587	262

Table 2: Effect of weed management practices on nutrient uptake (kg ha^{-1}) by rice

Treatments	N	P	K
T_1 - Unweeded control	92	14.79	97
T_2 - Weed free check	171	25.34	184
T_3 - Stale seedbed technique (SSBT) alone	133	19.24	143
T_4 - SSBT followed by One Hand Weeding at 25 DAT	161	23.76	171
T_5-SSBT followed by Pretilachlor 6.0% + pyrazosulfuron ethyl 0.15% GR @ 660 g ha^{-1} at 3 DAT	148	21.44	158
T_6-SSBT followed by Triafamone 20% + ethoxysulfuron 10% WG @ 220 g ha^{-1} at 8 DAT	159	23.19	169
T_7-SSBT Followed by 2,4-D Sodium salt @ 1560 g ha^{-1} at 35 DAT	136	20.05	148
T_8 - Pretilachlor 6.0% + pyrazosulfuron ethyl 0.15% GR @ 660 g ha^{-1} followed by Hand weeding at 35 DAT	121	17.49	130
T_9 - Pretilachlor 6.0% + pyrazosulfuron ethyl 0.15% GR @ 660 g ha^{-1} followed by 2,4-D Sodium salt @ 1560 g ha^{-1} at 35 DAT	117	16.78	124
S.Ed	3.07	0.51	3.37
CD (P=0.05)	6.52	1.09	7.14

Conclusion

Based on the result of field experiment, it concluded that stale seedbed technique followed one hand weeding at 25 DAT (T_4) which was statistically on par with Stale seedbed technique fb Triafamone 20% + ethoxysulfuron 10% WG @ 220 g ha^{-1} at 8 DAT. It was effective integrated weed management practices for controlling weeds and increased overall growth characters and grain yield of rice.

References

1. Bhat MA, Hussain A, Ganai I, Jehangir A, Teli NA. Bioefficacy of pyrazosulfuron and bensulfuron methyl in combination with pretilachlor against weeds in transplanted rice (*Oryza sativa* L.) under temperate conditions of Kashmir. J Crop Weed. 2017;13(1):178-182.
2. Bhurer KP, Yadav DN, Ladha JK, Thapa RB, Pandey K. Effect of integrated weed management practices on performance of dry direct seeded rice (*Oryza sativa* L.). Agronomy J Nepal. 2013;3:53-63.
3. Deivasigamani S. Study of bio-efficacy and phytotoxicity of new generation herbicides on triafamone and ethoxysulfuron in direct seeded rice (*Oryza sativa* L). Int J Appl Sci. 2016;3(2):106-112.
4. Dhanapal GN, Bai SK, Sanjay MT, Nagarjun P, Sandeep A. Efficacy of weed management practices in transplanted rice under southern dry zone of Karnataka. Indian J Weed Sci. 2018;50(3):294-297.
5. Directorate of Economics and Statistics (DES), Government of Tamil Nadu. Production of Major Agricultural crops; c2020-2021.
6. Gomez KA, Gomez AA. Statistical procedure for agricultural research. New York: John Wiley and Sons; c1984. p. 680.
7. Kumar A, Ladha JK. Direct seeding of rice: Recent developments and future research needs. Adv Agron. 2011;111:297-413.
8. Mishra GC, Rath AK, Rath BS, Sahoo J, Mohapatra PK. Weed management in direct seeded rice under rainfed upland ecosystem. J Crop Weed. 2008;2(2):52-57.
9. Mohapatra S, Tripathy SK, Tripathy S, Mohanty AK. Effect of sequential application of herbicides on productivity and profitability of transplanted rice. Indian J Weed Sci. 2021;53(2):129-134.
10. Parthipan T, Ravi V, Subramanian E. Integrated weed management practices on growth and yield of direct seeded lowland rice. Indian J Weed Sci. 2013;45(1):7-11.
11. Peer FA, Hassan B, Lone BA, Qayoom S, Ahmad L, Khanday BA, *et al*. Effect of weed control methods on yield and yield attributes of soybean. Afr J Agric Res. 2013;8:6135-6141.
12. Pooja K, Saravanane P. Performance of rice cultivars with weed management practices in dry direct-seeded rice.

Indian J Weed Sci. 2021;53(1):92-94.
13. Prashanthi CH, Laxminarayana P, Vidhyasagar GE, Sharma HK. Yield parameters and yield of aerobic rice (*Oryza sativa* L.) as influenced by different seedling methods and weed control measures. Int J Curr Microbiol Appl Sci. 2017;6(7):2474-2480.
14. Rao S, Kumar JH, Venkataramulu M, Reddy PR. Evaluation of different herbicides in direct seeded rice (*Oryza sativa* L.). Int J Curr Microbiol Appl Sci. 2019;(12):790-798.
15. Sanbagavalli S, Kandasamy OS, Anbumani S. Weed flora studies in stale seed bed technique of weed management. In: Proceedings of National Conference on Challenges in Weed Management in Agro-Ecosystems: Present status and future strategies. Coimbatore: TNAU; c2010. p. 100.
16. Shivram H, Yadav RS, Singh SP, Godara AS, Bijarniya AL, Samota SR, *et al*. Tillage and weed management effect on productivity of wheat in North-West Rajasthan. Indian J Weed Sci. 2020;52(2):127-131.
17. Singh GP, Roy DK, Yadav S. Effect of herbicide combinations and hand weeding on growth, yield and weed population in transplanted rice (*Oryza sativa* L.). Int J Chem Stud. 2018;6(5):154-157.
18. Sridevi S, Ramana MV, Suresh K, Madhavi M. Nutrient depletion by weeds, yield and economics of rice as influenced by weed management. In: Proceedings of 25th Asian-Pacific Weed Science Society Conference on Weed Science for Sustainable Agriculture, Environment and Biodiversity. Hyderabad, India; c2015. p. 100.
19. Uma G, Ramana MV, Reddy APK, Prakash TR. Evaluation of Low Dose Herbicides in Transplanted Rice (*Oryza Sativa* L.). Int J Appl Biol Pharm Technol. 2014;5(4):96-101.
20. USDA. World Agricultural Production. Foreign agricultural services office of global analysis report: USA. Circular series, WAP 4-22; c2022 Apr.
21. Yadav DB, Yadav A, Punia SS. Effectiveness of triafamone + ethoxysulfuron (Pre-mix) against complex weed flora in transplanted rice and its residual effects on wheat. Indian J Weed Sci. 2019;51(2):106-110.