



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2019; 7(3): 1988-1991

© 2019 IJCS

Received: 04-03-2019

Accepted: 06-04-2019

G Bagyalakshmi

Associate Professor (Agronomy)
Institute of Agriculture, AEC &
RI, Kumulur, Trichy,
Tamil Nadu, India

S Radhamani

Associate Professor (Agronomy)
Institute of Agriculture, AEC &
RI, Kumulur, Trichy,
Tamil Nadu, India

Studies on the influence of integrated weed management practices in direct wet seeded rice + *dhaincha* dual cropping

G Bagyalakshmi and S Radhamani

Abstract

A field experiment was conducted at wetland farm, Tamil Nadu Agricultural University, Coimbatore during *rabi*, 2016-17 to study the influence of integrated weed management practices in wet seeded rice + *dhaincha* dual cropping using the variety CO(R)51. The experiment was laid in randomized block design with three replications. The treatments comprised of application of bispyribac sodium 25 g/ha at 20 DAS/30 DAS with cono weeding at 40 DAS, 2, 4-D Na salt 0.5 kg/ha at 20 DAS/30 DAS with cono weeding at 40 DAS, chlorimuran ethyl + metsulfuron methyl 4 g/ha at 20 DAS/30 DAS with cono weeding at 40 DAS, cono weeding twice at 20/30 DAS and 40 DAS, hand weeding twice at 20 and 40 DAS and unweeded check. The results revealed that lower weed dry weight and higher weed control efficiency were recorded with hand weeding twice at 20 and 40 DAS which was comparable with application of bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS. Biomass addition of *dhaincha* ranged from 8.25 t/ha to 19.10 t/ha and nitrogen addition ranged from 43.69 kg/ha to 73.93 kg/ha. Efficient control of weeds along with green manure addition resulted in higher growth parameters and yield attributes of rice and recorded higher grain yield in hand weeding twice at 20 and 40 DAS (6535 kg/ha) and it was comparable with application of bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS (6244 kg/ha). Higher net return of Rs.55,556/ha was recorded with hand weeding twice at 20 and 40 DAS and it was closely followed by application of bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS (Rs.55,161/ha). However, the BC ratio was higher (2.59) with application of bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS due to less cost involved for weeding.

Keywords: Wet seeded rice, dual cropping, weed management, herbicides, yield, economics

1. Introduction

In India, rice (*Oryza sativa* L.) is cultivated in an area of 44.1 million hectares with a production of 105.5 million tonnes which is 27.91 per cent of world's area and 15.07 per cent of world's production with the second position next to China, hence rice production plays pivotal role in our national economy. Direct seeding of rice refers to the process of establishing the crop from seeds sown in the field rather than by transplanting seedlings from nursery (Farooq *et al.*, 2011)^[1]. According to Mahajan *et al.* (2013)^[2], declining water resources, limiting labour availability, increased cropping intensity, enhanced production requirement, depleting soil fertility, diminishing resource use efficiency, associated environmental hazards, and climatic catastrophes demand shifts from the conventional transplanting method towards direct seeding.

Weed flora of the experimental plot in wet seeded rice was grasses *viz.*, *Echinochloa colona*, *Echinochloa crus-galli*, *Echinochloa stagnina* and *Leptochloa chinensis*, sedges *viz.*, *Fimbristylis mileacea*, *Cyperus iria* and *Cyperus difformis* and broad leaved weeds *viz.*, *Ludwigia perennis*, *Lindernia crustacea*, *Monochoria vaginalis*, *Sphaeranthus indicus* and *Alternanthera sp* (Prameela *et al.* 2014)^[3]. The losses in grain yield due to unchecked weed growth were 45 to 49 per cent (Rajkhowa *et al.*, 2007)^[4]. Weed free treatment recorded significantly higher productive tillers and grain yield as compared to partial weedy treatment (Walia *et al.*, 2009)^[5].

Green manuring of rice with concurrent growing of leguminous annual crop like *dhaincha* (*Sesbania aculeata*) has been recommended to improve soil fertility and crop productivity, besides managing weeds effectively. Apart from better weed control, mineralization of nutrients from incorporated dual crop might have resulted in higher grain yield (Matiwade and

Correspondence**S Radhamani**

Associate Professor (Agronomy)
Institute of Agriculture, AEC &
RI, Kumulur, Trichy,
Tamil Nadu, India

(Sheelavantar, 1994) [6]. Nalini *et al.* (2008) [7] reported higher rice yield with green manure intercropping due to effective suppression of weeds, restriction of nutrient drain by weeds and nutrient addition due to incorporation of dual cropped green manure crop. Anitha *et al.* (2012) [8] reported that concurrent growing of *dhaincha* and its incorporation at 30 DAS resulted in a weed suppression of 70 per cent. Ravisankar *et al.* (2007) [9] reported that though rice + *dhaincha* registered higher grain yield when *dhaincha* was incorporated mechanically with cono weeder, it was on par with manual and manual + cono weeder. In general, intercropping of *dhaincha* in wet-seeded rice and incorporating it with either manual or cono weeder or manual + cono weeder led to higher grain yield in wet-seeded rice compared to sole wet-seeded rice (Balakrishnan *et al.*, 2007) [10].

No single weed control method is adequate for checking the weed population under wet seeded rice. Judicious combination of more than one method is warranted to keep the weed below the threshold level for higher productivity under rice + *dhaincha* dual cropping. Suitable time of application of different post emergence herbicides should also be given focus for efficient weed management while getting optimum biomass of *dhaincha* with subsequent incorporation using mechanical weeding. Hence, the following study was conducted with an objective to study the influence of integrated weed management practices in wet seeded rice + *dhaincha* dual cropping.

Materials and Methods

A field experiment was conducted at wetland farm, Tamil Nadu Agricultural University, Coimbatore during *rabi*, 2016-17 to study the influence of integrated weed management practices in wet seeded rice + *dhaincha* dual cropping using the variety CO (R) 51. The soil of experimental site was clay loam in texture with low in available nitrogen (278 kg/ha), medium in available phosphorus (18 kg/ha) and high in available potassium (628 kg/ha). The experiment was laid out

in randomized block design with three replications. The treatments comprised of application of bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS (T₁), 2,4-D Na salt 0.5 kg/ha at 20 DAS + cono weeding at 40 DAS (T₂), chlorimuron ethyl + metsulfuron methyl 4 g/ha at 20 DAS + cono weeding at 40 DAS (T₃), cono weeding twice at 20 and 40 DAS (T₄), bispyribac sodium 25 g/ha at 30 DAS + cono weeding at 40 DAS (T₅), 2,4-D Na salt 0.5 kg/ha at 30 DAS + cono weeding at 40 DAS (T₆), chlorimuron ethyl + metsulfuron methyl 4 g/ha at 30 DAS + cono weeding at 40 DAS (T₇), cono weeding twice at 30 and 40 DAS (T₈), hand weeding twice at 20 and 40 DAS (T₉) and unweeded check (T₁₀). For raising dual crop, rice and *dhaincha* were sown simultaneously using TNAU rice cum *dhaincha* seeder (RDS).

Observations were recorded on weed characters *viz.*, weed density and weed dry weight at 30, 60 and 90 DAS, growth characters of rice *viz.*, plant height, number of tillers/m², leaf area index, dry matter production and nutrient uptake at 30, 60 and 90 DAS and observations on *dhaincha viz.*, height, fresh biomass, dry matter accumulation under different weed management practices. Yield attributes *viz.*, number of productive tillers/m², number of filled grains/panicle, thousand grain weight and grain and straw yields were recorded. The economics in terms of cost of cultivation, gross return, net return and benefit cost ratio were worked out.

Results and Discussion

Weed control efficiency

Among the different weed management practices, hand weeding twice at 20 and 40 DAS (T₉) effectively controlled the weeds and recorded lower total weed density and total weed dry weight and it was comparable with application of bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS (T₁). Hand weeding twice at 20 and 40 DAS (T₉) recorded higher weed control efficiency and which was closely followed by application of bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS (T₁) (Table 1).

Table 1: Effect of weed management practices on weed control efficiency (%)

	Treatments	Weed control efficiency (%)	
		60 DAS	90 DAS
T ₁	Bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS	90.96	88.63
T ₂	2,4-D Na salt 0.5 kg/ha at 20 DAS + cono weeding at 40 DAS	85.84	79.32
T ₃	Chlorimuron ethyl + metsulfuron methyl 4 g/ha at 20 DAS + cono weeding at 40 DAS	87.69	82.06
T ₄	Cono weeding twice at 20 and 40 DAS	76.58	70.10
T ₅	Bispyribac sodium 25 g/ha at 30 DAS + cono weeding at 40 DAS	72.85	65.10
T ₆	2,4-D Na salt 0.5 kg/ha at 30 DAS + cono weeding at 40 DAS	68.22	62.27
T ₇	Chlorimuron ethyl + metsulfuron methyl 4 g/ha at 30 DAS + cono weeding at 40 DAS	68.68	61.11
T ₈	Cono weeding twice at 30 and 40 DAS	64.06	55.28
T ₉	Hand weeding twice at 20 and 40 DAS	93.28	90.71
T ₁₀	Unweeded check	-	-

(Data not statistically analysed)

Growth and yield parameters of rice

Hand weeding twice at 20 and 40 DAS (T₉) recorded greater magnitude of all the growth characters *viz.*, plant height, number of tillers/m², leaf area index and dry matter production of rice. It was comparable with application of bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS (T₁). Unweeded check (T₁₀) recorded lower crop growth characters.

The plant height of *dhaincha* at different time of incorporation ranged from 13.23 cm to 43.33 cm at 20 and 40 DAS. Biomass addition ranged from 8.25 t/ha at 20 DAS and at a maximum of 19.10 t/ha at 40 DAS. Nitrogen addition ranged from 43.69 kg/ha to 73.93 kg/ha. More number of productive tillers/m² and filled grains/panicle were recorded with hand weeding twice at 20 and 40 DAS (T₉) and it was comparable with application of bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS (T₁) (Table 2).

Table 2: Effect of weed management practices on productive tillers (No./m²), number of filled grains/panicle and 1000 grain weight (g) of rice at harvest

	Treatments	Productive tillers (No./m ²)	No. of filled grains/ panicle	1000 grain weight (g)
T ₁	Bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS	335	196	15.80
T ₂	2,4-D Na salt 0.5 kg/ha at 20 DAS + cono weeding at 40 DAS	283	175	15.60
T ₃	Chlorimuron ethyl + metsulfuron methyl 4 g/ha at 20 DAS + cono weeding at 40 DAS	301	189	15.70
T ₄	Cono weeding twice at 20 and 40 DAS	254	168	15.60
T ₅	Bispyribac sodium 25 g/ha at 30 DAS + cono weeding at 40 DAS	238	159	15.50
T ₆	2,4-D Na salt 0.5 kg/ha at 30 DAS + cono weeding at 40 DAS	219	148	15.30
T ₇	Chlorimuron ethyl + metsulfuron methyl 4 g/ha at 30 DAS + cono weeding at 40 DAS	223	151	15.40
T ₈	Cono weeding twice at 30 and 40 DAS	207	137	15.20
T ₉	Hand weeding twice at 20 and 40 DAS	351	203	15.90
T ₁₀	Unweeded check	183	116	15.10
	SEd	13	8	0.81
	CD (P=0.05)	27	17	NS

Grain and straw yield of rice

Among different weed management practices, hand weeding twice at 20 and 40 DAS (T₉) recorded higher grain and straw yield of 6535 and 7844 kg/ha, respectively. This was followed by application of bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS (T₁) which recorded grain and straw yield of 6244 and 7439 kg/ha, respectively (Table 3). This might be due to addition of *dhaincha*, which would have

contributed for the enhanced nutrient availability to the crop. This in turn increased the nutrient uptake and dry matter production which favored for the increased grain yield under the above treatments. Dahiphale *et al.* (2015) [11] also reported the higher productivity of rice by the application of post-emergence herbicide bispyribac sodium at the rate of 25 g/ha on 20 DAT in transplanted rice. The treatments failed to exert significant effect on harvest index of rice.

Table 3: Effect of weed management practices on grain yield (kg/ha), straw yield (kg/ha) and harvest index of rice

	Treatments	Grain yield (kg/ha)	Straw yield (kg/ha)	Harvest Index
T ₁	Bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS	6244	7439	0.456
T ₂	2,4-D Na salt 0.5 kg/ha at 20 DAS + cono weeding at 40 DAS	5502	6730	0.450
T ₃	Chlorimuron ethyl + metsulfuron methyl 4 g/ha at 20 DAS + cono weeding at 40 DAS	5832	7110	0.451
T ₄	Cono weeding twice at 20 and 40 DAS	4915	6350	0.436
T ₅	Bispyribac sodium 25 g/ha at 30 DAS + cono weeding at 40 DAS	4779	6328	0.430
T ₆	2,4-D Na salt 0.5 kg/ha at 30 DAS + cono weeding at 40 DAS	4226	5692	0.426
T ₇	Chlorimuron ethyl + metsulfuron methyl 4 g/ha at 30 DAS + cono weeding at 40 DAS	4620	6114	0.431
T ₈	Cono weeding twice at 30 and 40 DAS	3629	5107	0.415
T ₉	Hand weeding twice at 20 and 40 DAS	6535	7844	0.454
T ₁₀	Unweeded check	3039	4286	0.415
	SEd	247	346	0.019
	CD (P=0.05)	520	726	NS

Economics

Higher gross return (₹94109 /ha) and net return (₹55556 /ha) were recorded with hand weeding twice at 20 and 40 DAS (T₉) and it was closely followed by application of bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS (T₁) (₹

89802 and ₹55161/ha, respectively). Whereas, the BC ratio was higher (2.59) with the application of bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS (T₁) due to less cost involved for weeding and it was followed by hand weeding twice at 20 and 40 DAS (T₉) (2.44) (Table 4).

Table 4: Effect of weed management practices on gross return (₹/ha), net return (₹/ha) and benefit cost ratio of rice

	Treatments	Gross return (₹/ha)	Net return (₹/ha)	BC ratio
T ₁	Bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS	89802	55161	2.59
T ₂	2,4-D Na salt 0.5 kg/ha at 20 DAS + cono weeding at 40 DAS	79489	45786	2.36
T ₃	Chlorimuron ethyl + metsulfuron methyl 4 g/ha at 20 DAS + cono weeding at 40 DAS	84206	48753	2.38
T ₄	Cono weeding twice at 20 and 40 DAS	71686	37033	2.07
T ₅	Bispyribac sodium 25 g/ha at 30 DAS + cono weeding at 40 DAS	70000	35359	2.02
T ₆	2,4-D Na salt 0.5 kg/ha at 30 DAS + cono weeding at 40 DAS	62096	28393	1.84
T ₇	Chlorimuron ethyl + metsulfuron methyl 4 g/ha at 30 DAS + cono weeding at 40 DAS	67665	32212	1.91
T ₈	Cono weeding twice at 30 and 40 DAS	53761	19108	1.55
T ₉	Hand weeding twice at 20 and 40 DAS	94109	55556	2.44
T ₁₀	Unweeded check	45040	12487	1.38

(Data not statistically analysed)

Conclusion

The results revealed that hand weeding twice at 20 and 40 DAS and application of bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS were the efficient weed control

methods in wet seeded rice + *dhaincha* dual cropping for increasing the grain yield of rice. Due to labour scarcity and increased cost of labour, the returns per rupee invested become less by the use of more number of manual labourers

for the cultural operations in rice production. Hence, from the above results, under wet seeded rice + *dhaincha* dual cropping, application of bispyribac sodium 25 g/ha at 20 DAS + cono weeding at 40 DAS could be a viable option for getting higher rice grain yield and benefit cost ratio.

References

1. Farooq M, Siddique KH, Rehman H, Aziz T, Lee DJ, Wahid A. Rice direct seeding: Experiences, Challenges and Opportunities. *Soil Till. Res.* 2011; 111:87-98.
2. Mahajan G, Chauhan BS, Gill MS. Dry-seeded rice culture in Punjab State of India: lessons learned from farmers. *Field Crops Res.* 2013; 144:89-99.
3. Prameela P, Syama S Menon, Meera V Menon. Effect of new post emergence herbicides on weed dynamics in wet seeded rice. *J. Tropic. Agric.* 2014; 52(1):94-100.
4. Rajkhowa DJ, Deka NC, Borah N, Barua IC. Effect of herbicide with or without paddy weeder on weeds in summer rice. *Indian J. Agron.* 2007; 52(2):107-110.
5. Walia US, Bhullar MS, Nayyar S, Sidhu AS. Role of seed rate and herbicides on the growth and development of direct dry - seeded rice. *Indian J. Weed Sci.* 2009; 41(1, 2):33-36.
6. Matiwade PS, Sheelavantar MN. Growth analysis of rice as influenced by green manuring with *Sesbania rostrata*. *Oryza*, 1994; 31:196-198.
7. Nalini K, Jayanthi C, Vennila C. Weed management through dual cropping of green manure in semi-dry rice. *Indian J Weed Sci.* 2008; 40(1, 2):50-51.
8. Anitha S, Jose Mathew, Abraham CT. Concurrent growing of green manure with wet-seeded rice for cost-effective weed management. *Indian J Weed Sci.* 2012; 44(1):34-37.
9. Ravisankar N, Raja R, Din M, Elanchezhian R, Ghoshal Chaudhuri S. Response of rice (*Oryza sativa*) varieties and super rice cultures to anaerobic wet seeding in Bay Islands, *Indian J Agric. Sci.* 2007; 77(1):14-17.
10. Balakrishnan M, Ravisankar N, Meena K, Elanchezhian R, Zamir Ahmed SK. Yield prediction through feed forward neural network approach for direct seeded rice (*Oryza sativa*) in Bay Islands. In: Proceedings of 3rd Indian International Conference on Artificial Intelligence (IICAI-07) NIA, held at Pune. 2007, 1533-1541.
11. Dahiphale AV, Bhagat SB, Gangawane SB, Shinde PS, Govekar YR, Mahadkar UV. Effect of post-emergence herbicide on yield and yield contributing character of transplanted rice in north Konkan region. 25th Asian-Pacific Weed Science Society Conference on Weed Science for Sustainable Agriculture, Environment and Biodiversity, Hyderabad, India, 2015, 56-57.