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Performance of weed management practices and different varieties of rice on growth, productivity and profitability under moisture stress condition

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Abstract

A field experiment was carried out at Research Farm College of Horticulture, Pendri, Rajnandgaon, CG during *Kharif* 2015-16. The study was conducted for yield maximization of rice varieties and various management practices under moisture stress conditions. The treatments comprised six Management practices *viz.* M₁- RDF + Sequential application of herbicide; M₂- RDF + Integrated weed management (Pre-emergence herbicide *f.b.* mechanical weeding to act as weed control as well as soil mulch), M₃- RDF+2.5 t/ha FYM in row placement + Integrated weed management, M₄-RDF+ Foliar application of hydrated lime at 60-65 days + Integrated weed management, M₅-RDF+ 2.5 t ha⁻¹ FYM in row placement + Foliar application of hydrated lime at 60-65 days+ Integrated weed management, M₆-125% RDF+ 2.5 t ha⁻¹ FYM in row placement + Foliar application of hydrated lime at 60-65 days+ Integrated weed management as main plot and four varieties *viz.* V₁- Indira Barani Dhan-1, V₂- R-RF-75, V₃-Indira Aerobic-1, V₄-IR-64 (Drought) as sub plot with three replications. The data revealed that treatment M₆ was recorded the highest grain yield (40.04 q/ha). However, in case of minimum yield was recorded treatment M₁ (31.24 q ha⁻¹). In concerning with varieties R – RF- 75 was noted the highest yield (55.15 kg/ha). However, the lowest yield was recorded treatment v₁ (27.8 q ha⁻¹). From the experiment, varieties R – RF- 75 was recorded the highest grain yield in moisture stress condition and without supplementary irrigation. It was statistically at par with other treatments. Among different varieties of V₄ (R – RF- 75) fetched maximum net profit (Rs. 49344 ha⁻¹) and B: C ratio (2.86) while V₁ (Indira Barani Dhan-1) variety could bring lowest in net profit and B: C ratio. Among different Management practices @ M₆ recorded highest net return (36391) and highest B: C ratio was obtained 2.37.

Keywords: Rice varieties and weed management practices, productivity and profitability

Introduction

Rice is one of the principal food crop grown throughout the India and flourishes comfortably in hot and humid climate. Agriculture has been a forefront agenda at country and abroad level for food security and holistic management of all available resources. Cereals are the most important part of our diet throughout the world and thus, play major role in our food security. Among cereals, rice has been staple food for more than 60 per cent of the world population, providing energy for about 40% of the world population where every third person on earth rice every day in one form or other (Datta and Khushi, 2002) [4]. It is cultivated on an area of 42.5 million hectares with an annual production of 106.7 million tons in India (GOI, 2015) [5]. Upland rice, which is mostly dry-seeded, is found in parts of Assam, Bihar, Chhattisgarh, Gujarat, Jharkhand, Kerala, Karnataka, Madhya Pradesh, Orissa, Uttar Pradesh and West Bengal. The total annual loss in agriculture due to different pests is about 6,000 crore in India. More than one third of the total loss (33%) is caused by weeds alone (Mukherjee, 2006) [6]. Manual removal of weeds is labours intensive, tedious, back breaking and does not ensure weed removal at critical stage of crop-weed competition due to non -availability of labours and sometimes bad weather condition which does not allow labours to move in the field. However, transplanting is becoming increasingly difficult due to shortage and high labour charge, lack of water and increased production cost. As the higher production of rice is knowledge and labor intensive, different agro-techniques need to be adopted to make it more successful. Keeping in mind in this view present trial was conducted to find out Evaluation of Rice Varieties and

various management practices under Moisture Stress condition are good option for farmers to avoid such type of ill effect. However, it seems inevitable that farmers will still use a number of conventional herbicides, particularly those which meet health and environmental requirements, since no alternatives are available which give such an effective result for such a relatively low cost (Walia *et al.* 2008)^[8].

Materials and Method

The soil of the experimental field was clayey in texture locally known as Kanhar (Vertisol). The soil was Vertisol in texture with pH 7.4. Fertility status of soil were categories as low nitrogen (215.47 kg ha⁻¹) and medium phosphorus (13.30 kg ha⁻¹) and high in potassium (323.38 kg ha⁻¹), EC (0.13 dsm⁻¹ at 25 °C), organic carbon 0.4%, permanent wilting point (15.4%), water holding capacity (45.28%) and bulk density (1.34 Mg m⁻³). A field experiment was carried out at Research Farm College of Horticulture, Pendri, Rajnandgaon, CG during *Kharif* 2015-16.

The study was conducted for yield maximization of moisture stress tolerance of rice varieties and various management practices.

The treatments comprised six weed Management practices *viz.* M₁- RDF + Sequential application of herbicide; M₂- RDF + Integrated weed management (Pre-emergence herbicide *f.b.* mechanical weeding to act as weed control as well as soil mulch), M₃-RDF+2.5 t ha⁻¹ FYM in row placement + Integrated weed management, M₄-RDF+ Foliar application of hydrated lime at 60-65 days + Integrated weed management, M₅-RDF+ 2.5 t/ha FYM in row placement + Foliar application of hydrated lime at 60-65 days+ Integrated weed management, M₆-125% RDF+ 2.5 t/ha FYM in row placement + Foliar application of hydrated lime at 60-65 days+ Integrated weed management as main plot and four varieties *viz.* V₁- Indira Barani Dhan-1, V₂- R-RF-75, V₃- Indira Aerobic-1, V₄-IR-64 (Drought) as sub plot with three replications.

The crop was line sown during monsoon season period & fallows all the package of practices. Besides, other required material was used as per treatments. RDF were used 60:40:30 kg NPK/ha for V₁, V₂ and 80:50:30 kg NPK/ha for V₃, and V₄. Observations were recorded Yield and yield attributes, weed flora & Economics and statistically analysis. V₂ and 80:50:30 kg NPK/ha for V₃, V₄DF will be 60:40:30 kg NPK/ha fl,

Results and Discussions

As per the data recorded during observation time, revealed that treatment M₆ was recorded the highest grain yield (40.04 q/ha). However, in case of minimum yield was recorded treatment M₁ (RDF + Sequential application of herbicide) which was 31.24 q/ha.

The highest grain yield is due to less number of weeds germination in treated plots resulting in minimum biomass production, higher yield attributes and maximum selectivity of herbicides for weed control was assumed under IWM practices along with foliar application of hydrated lime at 60-65 days. Similar results have been also reported by Bahar and Singh (2004)^[1]. The findings are in agreement with the findings of Bohra *et al.* (2006)^[3]. In concerning with varieties R - RF- 75 was noted the highest grain, straw yield & Harvest Index (%) (41.1 q⁻¹ ha) & (55.15 q ha⁻¹) respectively. However, the lowest grain yield was recorded treatment v₁ (27.8 q/ha).

From the experiment, varieties R – RF- 75 was noted the highest grain yield under moisture stress condition and without supplementary irrigation. It was statistically at par with other treatments. Among different varieties of V₄ (R – RF- 75) fetched maximum net profit (Rs. 49344 ha⁻¹) and B: C ratio (2.86) while V₁ (Indira Barani Dhan-1) variety could bring lowest in net profit and B: C ratio. Among different Management practices @ M₆ (125% RDF+ 2.5 t/ha FYM in row placement + Foliar application of hydrated lime at 60-65 days+ Integrated weed management) recorded highest net return (36391) and highest B: C ratio was obtained 2.37. The dominant weed flora recorded with trialed field were *Eclipta alba* (L.) (Bhringraj) *Echinochloa colonum* (L.), *Sagittaria pygmaea* (L.), *Commelina Benghalensis* (L.), *Cyperus iria* (L.). Integrated weed management *viz.* Pre-emergence (Butachlor 1.0 kg ai ha⁻¹) Herbicide *f.b.* mechanical weeding (Cono weeder) to act as weed control as well as soil mulch, to found effective control of wide range of weed flora. Similar results have been also reported by Bhat *et al.* (2011)^[2] which was Chlorimuron ethyl + Metsulfuron methyl 20% WP provided good control of broad leaved weeds and sedges, while Bensulfuron-methyl was effective against sedges. Subbalakshmi and Pandian (2002)^[7] have a reported that in existing practices, weed intensity (No. m⁻²) in various time recorded higher than the application of Butachlor 1.0 kg ai/ha as pre emergence.

Table 1: Effect of Management Practices & Varieties on Grain yield, straw yields (q/ha) and Harvest Index (%) of rice

Treatments	Symbol	straw yields (q/ha)	Grain yield, (q/ha)	Harvest Index (%)
RDF + Sequential application of herbicide	M ₁	39.70	31.24	55.96
RDF + IWM	M ₂	45.46	37.04	55.10
RDF+2.5 t/ha FYM in row placement +IWM	M ₃	44.15	38.81	53.22
RDF+ Foliar application of hydrated lime at 60-65 days + IWM	M ₄	44.09	35.77	55.21
RDF+ 2.5 t/ha FYM in row placement + Foliar application of hydrated lime + IWM	M ₅	46.63	39.26	54.29
125% RDF+ 2.5 t/ha FYM in row placement + Foliar application of hydrated lime + IWM	M ₆	47.40	40.04	54.21
	SEm ±	1.74	1.20	0.24
	CD(P=0.0)	3.37	3.71	0.65
Indira Barani Dhan-1	V ₁	36.18	27.8	56.55
R-RF-75	V ₂	55.15	43.1	56.13
Indira Aerobic-1	V ₃	43.71	35.3	55.32
IR-64 (Drought)	V ₄	44.58	38.2	53.85
	SEm ±	1.26	1.92	0.75
	CD(P=0.0)	3.29	4.6	2.10

Table 2: Effect of Management Practices & Varieties on profitability of rice

Treatments	Symbol	Gross Return (Rs/ha)	COC (Rs/ha)	Net Return (Rs/ha)	B:C ratio
RDF + Sequential application of herbicide	M ₁	49261.4	24000	25261	2.05
RDF + IWM	M ₂	58255.5	24500	33755	2.38
RDF+2.5 t/ha FYM in row placement +IWM	M ₃	60682.7	25000	35682	2.43
RDF+ Foliar application of hydrated lime at 60-65 days + IWM	M ₄	56280.1	25500	30780	2.21
RDF+ 2.5 t/ha FYM in row placement + Foliar application of hydrated lime + IWM	M ₅	61695.1	26000	35695	2.37
125% RDF+ 2.5 t/ha FYM in row placement + Foliar application of hydrated lime + IWM	M ₆	62891.0	26500	36391	2.37
Indira Barani Dhan-1	V ₁	43949.4	24000	19949	1.83
R-RF-75	V ₂	69344.8	24000	49344	2.86
Indira Aerobic-1	V ₃	55601.6	24000	31601	2.32
IR-64 (Drought)	V ₄	59814.7	24000	35814	2.49

Conclusions

The findings concluded that treatment M₆ was recorded the highest grain yield (40.04 q ha⁻¹). However, in case of minimum yield was recorded treatment M₁ (31.24 q ha⁻¹). In concerning with varieties R – RF- 75 was noted the highest yield (55.15 kg ha⁻¹). However, the lowest yield was recorded treatment V₁ (27.8 q ha⁻¹). From the experiment, varieties R – RF- 75 was recorded the highest grain yield in moisture stress condition and without supplementary irrigation. It was statistically at par with other treatments. Among different varieties of V₄ (R – RF- 75) fetched maximum net profit (Rs. 49344 ha⁻¹) and B: C ratio (2.86) while V₁ (Indira Barani Dhan-1) variety could bring lowest in net profit and B: C ratio. Among different Management practices @ M₆ recorded highest net return (36391) and highest B: C ratio was obtained 2.37.

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