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RG Patil
M. Sc. (Agri.) Scholar, Department of Agronomy, College of Agriculture Dapoli, DBSKKV, Dapoli, Maharashtra, India

VG More
Agrometeorologist, AICRP on Agrometeorology, Department of Agronomy, College of Agriculture Dapoli, DBSKKV, Dapoli, Maharashtra, India

PS Bodake
Head, Department of Agronomy, College of Agriculture Dapoli, DBSKKV, Dapoli, Maharashtra, India

MJ Mane
Associate Professor, Department of Agronomy, College of Agriculture Dapoli, DBSKKV, Dapoli, Maharashtra, India

RV Dhopavkar
Assistant Professor, Department of Soil Science and Agriculture Chemistry, College of Agriculture Dapoli, DBSKKV, Dapoli, Maharashtra, India

PB Bansode
Assistant Professor of Statistics, College of Agril. Engg. & Tech. Dapoli, DBSKKV, Dapoli, Maharashtra, India

BB Gade
M. Sc. (Agri.) Scholar, Department of agronomy, College of Agriculture Dapoli, DBSKKV, Dapoli, Maharashtra, India

GS Khedekar
M. Sc. (Agri.) Scholar, Department of agronomy, College of Agriculture Dapoli, DBSKKV, Dapoli, Maharashtra, India

Corresponding Author:
RG Patil
M. Sc. (Agri.) Scholar, Department of Agronomy, College of Agriculture Dapoli, DBSKKV, Dapoli, Maharashtra, India

Effect of pre-emergence herbicides on growth and yield of puddled rice under lateritic soils of Konkan

RG Patil, VG More, PS Bodake, MJ Mane, RV Dhopavkar, PB Bansode, BB Gade and GS Khedekar

Abstract
A field experiment was conducted in *kharif*, 2021 to study the effect of pre-emergence herbicides on growth and yield of puddled rice under Konkan lateritic soil. A positive significantly effect of growth parameters and yield attributing characters were observed under weed free check (two hand weeding at 30 and 60 DAT) and was at par with Imazosulfuron 1% GR @ 150 g. a.i. ha^{-1} + Pretilachlor 8% @ 1200 g. a.i. ha^{-1}, Imazosulfuron 1% GR @100 g. a.i. ha^{-1} + Pretilachlor 8% @ 800 g. a.i. ha^{-1} and Imazosulfuron 1% GR @ 75 g. a.i. ha^{-1} + Pretilachlor 8% @ 600 g. a.i. ha^{-1}.
The grain and straw yield were significantly enhanced under treatment weed free check and at par with Imazosulfuron 1% GR @ 150 g. a.i. ha^{-1} + Pretilachlor 8% @ 1200 g. a.i. ha^{-1}, Imazosulfuron 1% GR @ 100 g. a.i. ha^{-1} + Pretilachlor 8% @ 800 g. a.i. ha^{-1} and Imazosulfuron 1% GR @ 75 g. a.i. ha^{-1} + Pretilachlor 8% @ 600 g. a.i. ha^{-1}.
Density and dry weight of grasses, sedges and broad leaved weeds at 30, 60 DAT and at harvest were significantly higher under untreated control (T_8) as compared to rest of the weed control treatments. The weed free check recorded lowest density and dry weight of total weeds followed by pre-emergence application of Imazosulfuron 1% GR @ 150 g. a.i. ha^{-1} + Pretilachlor 8% @ 1200 g. a.i. ha^{-1}. The highest weed control efficiency was recorded in Imazosulfuron 1% GR @150 g. a.i. ha^{-1} + Pretilachlor 8% @ 1200 g. a.i. ha^{-1} (T_4) (77.65%) followed by weed free check (74.86%). The lower weed index was reported by Imazosulfuron 1% GR @ 150 g. a.i. ha^{-1} + Pretilachlor 8% @ 1200 g. a.i. ha^{-1} (4.51%) followed by Imazosulfuron 1% GR @ 100 g. a.i. ha^{-1} + Pretilachlor 8% @ 800 g. a.i. ha^{-1} (4.55).

Keywords: Rice, herbicides, weed, Konkan

1. Introduction
Rice (*Oryza sativa* L.) is the most important staple food crop of the world and ranks second to wheat in terms of area, however it provided more calories per hectare than the other cereals. In India, it contributes 43 per cent of total food grain production and 46 per cent of total cereal production. In Maharashtra, area under rice is 1.53 mha with production of 3.51 mt and productivity of 1873 kg ha^{-1}during 2019-2020. (Anonymous, 2020b) [2]. A total of 49 per cent calories consumed by the world human population come from rice, wheat, and maize, whereas 23 per cent provided by rice, 17 per cent by wheat and 9 per cent by maize. Thus almost 25 per cent of the calories consumed by the entire world human population come from rice.
Maharashtra state is low productivity as compared to other rice growing states like West Bengal, Uttar Pradesh, Punjab, Odisha, Tamil Nadu, Haryana, Andhra Pradesh etc (Anonymous, 2020b) [2]. In Konkan, rice is grown in an area of 0.39 mha with production of about 1.52 mt and productivity of 2930 kg ha^{-1}. (Anonymous, 2020b) [2]. The area, production and productivity of the is more than rest of Maharashtra.
One of the constraint of low yield is weed competition. That may diminish grain output by 32 per cent (Singh *et al*. 2007) [5]. Weeds need to managed early to prevent the wasteful usage of growth factors and allow the crop plant to completely express itself by utilising these components that are intended for it. Herbicides are effective against weed, but the majority of them targeted a limited number of weed species (Mukherjee and Singh, 2005) [3]. Therefore, it is necessary to create effective and affordable weed management technology for the sustainable rice production.
Despite being the greatest approach, hand weeding takes a long time and not cost-effective with labour shortages in the field. To acquire timely and efficient weed management, it has the given importance to develop and justifies the use of herbicides. It is anticipated that use of herbicides may reduce weed problem in transplanted rice of Konkan region.

With this, research was conducted on rice crop with the help of different pre-emergence herbicides with an objective to control weeds before germination without any other use of weed control measures except chemical weed control.

2. Materials and Methods

The field experiment was conducted at Instructional Farm, Department of Agronomy, Collage of Agriculture Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli during *kharif*, 2021 with the rice variety of Ratnagiri-1 (Rice IR-8 × Ratnagiri-24). The site was selected on the basis of suitability of soil for growing early rice variety. Topography of the plot was fairly uniform with a slight gradient towards the west. The soil analysis indicated that, the experimental plot was sandy loam in texture, medium in available nitrogen (242.6 kg ha^{-1}), phosphorus (13.4 kg ha^{-1}) and potassium (237.2 kg ha^{-1}), very high in organic carbon (13.7 g kg^{-1}), slightly acidic in reaction (pH 6.24) with 0.10 dS m^{-1} electrical conductivity.

The experiment was laid out in Randomized Block Design (RBD) with nine treatments replicated thrice. The treatments detalis are as given in table 1. The recommended dose of fertilizers (100: 50: 50 kg N, P_2O_5 and K_2O kg ha^{-1}) and other package of practices for rice were imposed uniformly for all the treatments including control treatments except weed management treatments.

Table 1: Treatment details for the field experiment

Symbols	Treatments
T_1	Imazosulfuron 1% GR @ 50 g. a.i. ha^{-1} + Pretilachlor 8% @ 400 g. a.i. ha^{-1}
T_2	Imazosulfuron 1% GR @ 75 g. a.i. ha^{-1} + Pretilachlor 8% @ 600 g. a.i. ha^{-1}
T_3	Imazosulfuron 1% GR @ 100 g. a.i. ha^{-1} + Pretilachlor 8% @ 800 g. a.i. ha^{-1}
T_4	Imazosulfuron 1% GR @ 150 g. a.i. ha^{-1} + Pretilachlor 8% @ 1200 g. a.i. ha^{-1}
T_5	Metsulfuron methyl 20% WP @ 4 g. a.i. ha^{-1}
T_6	Pretilachlor 50% EC @ 750 g. a.i. ha^{-1}
T_7	Pretilachlor 30% @ 600 g. a.i. ha^{-1} + Pyrozosulfuron 0.75% WG @ 15 g. a.i. ha^{-1}
T_8	Untreated Control
T_9	Weed free check (two hand weeding at 30 and 60 DAT)

3. Results and discussion

In rice (*Oryza sativa* L.) var. Ratnagiri-1, the plant growth and yield attributes as well as crop yields were influenced by application of herbicides.

3.1 Effect on growth parameters

Uniform plant stand was noticed when counted at 20 DAT and at harvest stage of the rice crop in the experimental plot. Hence there was no any significant difference among treatments due to plant population.

Growth attributes *viz*., plant height (cm), number of tillers $hill^{-1}$, dry matter accumulation (g $hill^{-1}$) have showed significant difference between treatments at 60, 90 and at harvest stage of rice crop. Significantly higher values were found with the weed free check (two hand weeding at 30 and 60 DAT) (T_9) and was at par with treatments Imazosulfuron 1% GR @150 g. a.i. ha^{-1} + Pretilachlor 8% @ 1200 g. a.i. ha^{-1}(T_4), Imazosulfuron 1% GR @100 g. a.i. ha^{-1} + Pretilachlor 8% @ 800 g. a.i. ha^{-1} (T_3) and Imazosulfuron 1% GR @75 g. a.i. ha^{-1} + Pretilachlor 8% @ 600 g. a.i. ha^{-1} (T_2). But there was no any significant difference due to different weed management treatments at 30 DAT.

Table 2: Influence of herbicides on growth parameters

Treatments	Plant height (cm)				No. of tillers per hill				Dry weight (g)			
	30 DAT	60 DAT	90 DAT	At harvest	30 DAT	60 DAT	90 DAT	At harvest	30 DAT	60 DAT	90 DAT	At harvest
T1	17.20	73.42	82.92	85.37	8.85	14.53	16.03	12.13	7.76	18.86	34.23	48.17
T2	17.33	73.91	83.48	85.92	8.82	14.63	16.13	12.21	7.81	19.11	35.49	48.48
T3	18.13	75.42	85.18	87.62	9.16	14.92	16.43	12.44	7.83	20.01	36.12	49.42
T4	16.83	75.45	85.22	87.65	8.63	14.92	16.44	12.44	7.91	20.8	38.62	49.44
T5	16.30	71.02	80.21	82.68	8.76	14.08	15.55	11.77	7.64	18.65	32.68	46.67
T6	16.73	69.31	78.29	80.77	8.73	13.75	15.20	11.52	7.59	18.49	30.46	45.61
T7	16.53	71.18	80.40	82.87	8.50	14.11	15.58	11.80	7.71	18.77	33.24	46.78
T8	16.13	69.81	78.85	81.33	9.01	13.84	15.30	11.59	7.62	18.56	31.78	45.92
T9	18.47	79.01	89.23	91.64	9.18	15.60	17.16	12.98	8.04	22.93	40.77	51.66
S.Em. ±	0.47	1.83	2.06	2.05	0.21	0.35	0.37	0.28	0.21	0.54	0.96	1.14
C. D. at 5%	NS	5.49	6.19	6.15	NS	1.05	1.11	0.83	NS	1.60	2.87	3.42

3.2 Effect on yield and yield attributing characteristics

All the yield attributing characters except 1000 grain weight *viz*., number of panicles $hill^{-1}$, number of grains $panicle^{-1}$, panicle length (cm), percent filled grains $panicle^{-1}$, percent unfilled grains $panicle^{-1}$ and weight of grains $panicle^{-1}$ have shown significant difference between treatments. Significantly higher values were observed with treatment weed free check (two hand weeding at 30 and 60 DAT) (T_9) and it was at par with treatments Imazosulfuron 1% GR @150 g. a.i. ha^{-1} + Pretilachlor 8% @ 1200 g. a.i. ha^{-1} (T_4), Imazosulfuron 1% GR @100 g. a.i. ha^{-1} + Pretilachlor 8% @ 800 g. a.i. ha^{-1} (T_3) and Imazosulfuron 1% GR @75 g. a.i. ha^{-1} + Pretilachlor 8% @ 600 g. a.i. ha^{-1} (T_2). There was no any significant difference between treatments for 1000 grain weight.

Table 3: Influence of herbicides on yield (grain and straw) and yield attributing characteristics

Treatments	No. of panicles hill^{-1}	No. of grains panicle^{-1}	Panicle length (cm)	1000 grain wt. (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
T1	9.72	164.06	23.43	22.59	5319.05	6769.70
T2	9.82	172.04	24.51	22.74	5354.76	6815.15
T3	10.02	174.00	24.52	23.21	5464.29	6954.55
T4	10.02	178.00	24.83	23.22	5466.55	6957.43
T5	9.45	150.00	23.20	22.51	5145.12	6548.34
T6	9.23	143.73	21.27	22.31	5021.43	6390.91
T7	9.47	153.00	23.19	22.23	5157.14	6563.64
T8	9.29	148.00	21.28	21.47	5057.62	6436.97
T9	10.48	184.00	25.18	23.33	5724.53	7285.76
S.Em. ±	0.23	4.44	0.47	0.62	132.58	168.74
C. D. at 5%	0.70	13.31	1.40	NS	397.48	505.88

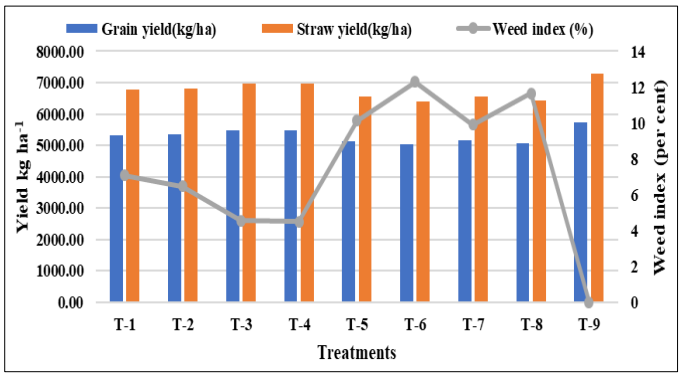

Fig 1: Graph showing grain, straw yield and weed index

Similarly, yield characters *viz*., grain (kg ha^{-1}), straw (kg ha^{-1}) and biological yield (kg ha^{-1}) have shown significant difference between different weed management treatments. Significantly higher yield obtained by treatment weed free check (two hand weeding at 30 and 60 DAT) (T_9) over rest of the treatment under study except treatments Imazosulfuron 1% GR @150 g. a.i. ha^{-1} + Pretilachlor 8% @ 1200 g. a.i. ha^{-1} (T_4), Imazosulfuron 1% GR @100 g. a.i. ha^{-1} + Pretilachlor 8% @ 800 g. a.i. ha^{-1} (T_3) and Imazosulfuron 1% GR @75 g. a.i. ha^{-1} + Pretilachlor 8% @ 600 g. a.i. ha^{-1} (T_2) which were at par with treatment (T_9).

3.3 Effect on weed growth

The weed free check (hand weeding at 30 and 60 DAT) (T_9) recorded lowest density and dry weight of total weeds followed by treatment pre-emergence application of Imazosulfuron 1% GR @150 g. a.i. ha^{-1} + Pretilachlor 8% @ 1200 g. a.i. ha^{-1} (T_4) during the year of investigation. The density and dry weight of grasses, sedges and broad leaved weeds at 30, 60 DAT and at harvest were significantly higher under untreated control (T_8) as compared to rest of the weed control treatments under study.

The highest weed control efficiency was recorded by treatment Imazosulfuron 1% GR @150 g. a.i. ha^{-1} + Pretilachlor 8% @ 1200 g. a.i. ha^{-1} (T_4) (77.65%) followed by treatment weed free check (hand weeding at 30 and 60 DAT) (T_9) (74.86%) during the year of investigation.

The lower weed index value (4.51%) was reported by treatment pre-emergence application of Imazosulfuron 1% GR @150 g. a.i. ha^{-1} + Pretilachlor 8% @ 1200 g. a.i. ha^{-1} (T_4) followed by treatment Imazosulfuron 1% GR @ 100 g. a.i. ha^{-1} + Pretilachlor 8% @ 800 g. a.i. ha^{-1} (T_3) (4.55) while, higher weed index value (12.28%) was recorded by treatment Pretilachlor 50% EC @ 750 g. a.i. ha^{-1} (T_6), during the year of investigation.

3.4 Economics of treatments

In respect of economics, it was observed that treatment weed free check (hand weeding at 30 and 60 DAT) (T_9) earned the higher gross returns (₹ 129270.21) which was followed by the treatment Imazosulfuron 1% GR @ 100 g. a.i. ha^{-1} + Pretilachlor 8% @ 800 g. a.i. ha^{-1} (T_3) (₹ 123393.56). The treatment weed free check (hand weeding at 30 and 60 DAT) (T_9) gave the higher net returns (₹ 30450.93) and B:C ratio (1.31) which was followed by the treatment pre-emergence application of Imazosulfuron 1% GR @ 100 g. a.i. ha^{-1} + Pretilachlor 8% @ 800 g. a.i. ha^{-1} (T_3) (₹ 28754.28) (1.30) respectively, during the year of study.

Treatments	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Gross returns (₹ ha^{-1})	Net returns on input cost (₹ ha^{-1})	B:C ratio (on input cost)
T1	5319.05	6769.70	120113.81	25864.53	1.27
T2	5354.76	6815.15	120920.31	26476.03	1.28
T3	5464.29	6954.55	123393.56	28754.28	1.30
T4	5466.55	6957.43	122592.45	27563.17	1.29
T5	5145.12	6548.34	116186.19	22086.91	1.23
T6	5021.43	6390.91	113393.03	19271.25	1.20
T7	5157.14	6563.64	116457.70	21957.17	1.23
T8	5057.62	6436.97	114210.29	22831.01	1.25
T9	5724.53	7285.76	129270.21	30450.93	1.31
General mean	132.58	168.74	119615.28	25028.36	1.26

4. Conclusion

The study on the effect of pre-emergence herbicides on growth and yield of puddled rice under lateritic soils of Konkan concluded that, under the labour shortage for obtaining higher net returns and B:C ratio under Konkan condition the rice crop should be applied with pre-emergence herbicide Imazosulfuron 1% GR @100 g. a.i. ha^{-1} + Pretilachlor 8% @ 800 g. a.i. ha^{-1}.

5. References

1. Anonymous. Department of Agriculture Maharashtra State final estimate; c2020a. krishi.maharashtra.gov.in 2019-20.
2. Anonymous. 2020b. Agricultural Statistics at a Glance. Directorate of Economics and Statistics, Ministry of Agriculture & Farmers Welfare, Govt. of India; c2020.
3. Mukherjee D, Singh RP. Effect of low doses herbicides on weeds, nutrient uptake and yield of transplanted rice. Indian J of Agronomy. 2005;50(3):194-196.
4. Sharma RP, Pathak SK, Singh RC. Effect of nitrogen and weed management in direct-seeded rice (*Oryza sativa* L.) under upland conditions. Ind. J Agron. 2007;52(3):114-119.
5. Singh P, Singh P, Singh SS. Response of aromatic rice (Pusa Basmati 1) to establishment methods, fertility levels and weed management practices. Indian J Weed Sci. 2007;39(1/2):32-35.