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Shakshi Dubey
Department of Agronomy, School of Agricultural Science, Shri Guru Ram Rai University, Dehradun Uttarakhand, India

Dr. Priyanka Bankoti
Department of Agronomy, School of Agricultural Science, Shri Guru Ram Rai University, Dehradun Uttarakhand, India

Garima Kaushik Parashar
Department of Agronomy, School of Agricultural Science, Shri Guru Ram Rai University, Dehradun Uttarakhand, India

Correspondence Author:
Shakshi Dubey
Department of Agronomy, School of Agricultural Science, Shri Guru Ram Rai University, Dehradun Uttarakhand, India

Response of weed management practices on growth of upland direct seeded rice (*Oryza sativa* L.)

Shakshi Dubey, Dr. Priyanka Bankoti and Garima Kaushik Parashar

Abstract
A field experiment was planned and conducted in Rice field during 2022 at crop research Centre Shri Guru Ram University, School of Agricultural Sciences, Dehradun, Uttarakhand. To investigate the "Response of weed Management Practices on Growth of Upland Direct Seeded Rice''. The experiment was laid out in randomized block design with three replications and eight treatments *viz.,* No mulch with weed management (hand weeding at every 15 days Interval), Hand weeding twice at 20 DAS and 45 DAS, mulching with biodegradable polythene sheet 25 DAS, Wheat straw mulch 5 T/ha+ Hand weeding 20 DAS, manually weeding, Rice straw mulching 5 T/ha + Hand weeding 20 DAS, Green leaf mulching 5 T/ha + Hand weeding 20 DAS and Weedy check. Rice variety Pusa Basmati-1509 was used as a medium of trial. Densities of total weeds were reduced significantly by application of mulches or other treatments and dry weight of weeds (grasses, sedges and broad leaves weeds) was also affected by the use of mulches and other treatments of weed management. Different treatments of weed management significantly improved the agronomic traits of Direct Seeded Rice (DSR). Mulching with biodegradable polythene sheet 25DASresulted in maximum plant height (82.26 cm), Dry matter production of crop plant (14.871 g/m^2) and Leaf area Index (4.620).
The result showed that various growth parameters like plant height, Dry matter production of crop plant (g/m^{-2}), and leaf area index. A periodic observation of various parameters was taken from five tagged plants at net plot of various stages of crop growth and was subjected to analysis of variance (ANOVA).

Keywords: Direct seeded rice**,** plastic mulching, weed management, leaf area index

Introduction
Rice (*Oryza sativa* L.) is a self-pollinated crop with being the first most important cereal crop of India that plays an important role in our daily dietary. It is a member of Poaceae family and is the primary food source for almost 60% of the world's population (Bista, 2018) [3] therefore known as "Global Grain". Rice is being grown in many regions of the world. Rice is farmed on 161 million hectares of land, producing 509.87 million metric tons of milled rice year (Statista 2021) [8]. Asian countries grow almost 90% of the world's rice. The world's population is growing, and the demand for food in order to meet the global food demand by 2050, the food production must therefore be boosted by 70% (Muthayya *et al.*, 2014) [6]. Rice contributes nutritionally significantly amount of the Thiamine, Riboflavin, Niacin and Zinc to the diet. Production of Rice in India is an important part of the National economy. India is the second largest producer of rice and the largest exporter of rice in the world. Year after year India has to increase its rice productivity but the possibility of expanding the area under rice is near future is limited with better Agronomic practices the productivity of rice can be increased many folds. Generally, there are two basic methods of rice cultivation namely, transplanting and direct seeded rice. Transplanting is the system of raising seedlings first in nursery bed and then planted to field. Whereas Direct seeded rice refers to the process of establishing a rice crop from the seeds sown in the field. Recently, in response to rising labor cost, competitive demands for water the need to intensify crop production. Transplanting rice is labor intensive (30 person/ha/day) and also cost of labor is rising for transplanting of paddy. Singh *et al.*, 2013 [7] reported that Direct seeded rice (DSR), likely the oldest method of cultivating rice, is planted in the field from seed rather than transplanting seedlings from a nursery. DSR is better than transplanting rice due to potential to save water and labor cost thus DSR gives 5-10% more yield than the transplanting rice. DSR technique is becoming popular nowadays because of its less time consuming in nature. In DSR there is a huge problem of weed management as Rice and rice weeds have similar requirements for growth and development. Competition occurs when one

of the resources (nutrients, light, moisture and space) fall short of total requirement of rice and weeds. Thus the development of short duration early maturity cultivars and efficient nutrient management techniques along with increase adoption of integrated weed management methods have encouraged many farmers to switch from transplanting to DSR culture. It will reduce burning of rice straw that is environmentally unacceptable as its leads to the release of soot particles and smoke causing human health problems, such as asthma or other respiratory problems, emission of greenhouse gases such as carbon dioxide, methane and nitrous oxide causing global warming. In addition, the entire amount of carbon and Nitrogen, 25% Phosphorus and 20% of Potassium present in the straw are lost due to burning. This highlights the need for a comprehensive and scientific strategy to make direct seeded rice environmentally and Socio economically sustainable.

Materials and Methods

The current research entitled "Response of weed Management Practices on Growth of Upland Direct Seeded Rice'' was conducted during kharif season in 2022, at the Agricultural Research Farm, Department of Agronomy, Shri Guru Ram Rai University, Dehradun, Uttarakhand (India). The city is located at 25.28° North latitude and 81.54° East longitude and 410 m above sea level. The experiment was laid out in Randomized Block Designs with eight treatments replicated thrice. The treatments comprised of different weed management practices *viz*., No mulch with weed management (hand weeding at every 15 days Interval) (T_1), Hand weeding twice at 20 DAS & 45D AS (T_2), Mulching with biodegradable polythene sheet 25 DAS (T_3), Wheat straw mulch 5 T/ha + Hand weeding 20 DAS (T_4), Manually weeding (T_5), Rice straw mulching 5T/ha + Hand weeding 20 DAS (T_6), Green leaf mulching 5T/ha + Hand weeding 20 DAS (T_7), Weedy check (T_8). To determine the effect of weed management practices on growth of upland direct seeded rice. The experiment site was sandy loam in texture with pH 6.5, organic carbon (0.42%), available nitrogen (3.52%), available phosphorus (7.1%), available potassium (18.1%). Between germination to harvesting several plant growth parameters were recorded. In growth parameter plant height (cm), dry matter production of crop plant (g/m^2), leaf area index (LAI). The data recorded for different characteristics were subjected to statistical analysis by adopted the method of ANOVA.

Results and Discussion

Growth parameters

The different weed management practices showed a significant effect on growth parameters under upland direct seeded rice. The results obtained from study have been discussed below.

Plant height (cm)

At 90 DAS, maximum plant height (82.26 cm) was recorded with T_3 Mulching with biodegradable polythene sheet 25 DAS which was significantly superior over all the other treatments and statistically at par with treatments of No mulch with weed management (hand weeding at every 15 days Interval) (79.93 cm) and Wheat straw mulch 5 T/ha + Hand weeding 20 DAS (78.86 cm).

Dry matter production of crop plant (g/m^2)

At 90 DAS the maximum dry matter production of crop plant (14.871 g/m^2) was recorded with application of T_3 - Mulching with biodegradable polythene sheet 25 DAS which was significantly superior over all the other treatments and statistically at par with treatments of No mulch with weed management (hand weeding at every 15 days Interval) (13.204 g/m^2) and Wheat straw mulch 5T / ha + Hand weeding 20 DAS (12.028 g/m^2).

Leaf Area Index (LAI)

At 90DAS the maximum Leaf area Index (4.620) was recorded with application of T_3 - Mulching with biodegradable polythene sheet 25 DAS which was significantly superior over all the other treatments and statistically at par with treatments of hand weeding at every 15 days interval (2.997) and Wheat straw mulch 5 T/ha + Hand weeding 20 DAS (2.973).

Table 1: Effect of weed management practices on Growth of upland direct seeded rice

Treatments	90DAS		
	Plant height (cm)	Dry matter production of crop plant (g/m^2)	Leaf area Index (LAI)
No mulch with weed management (hand weeding at every 15 days Interval)	79.93	13.204	2.997
Handweedingtwiceat20DAS&45DAS	76.733	11.76	2.563
Mulching with biodegradable polythene sheet 25 DAS	82.26	14.871	4.620
Wheat straw mulch 5 T/ha + Hand weeding 20 DAS	78.86	12.028	2.973
Manually weeding	76.13	11.751	2.670
Rice straw mulching 5 T / ha + Hand weeding 20 DAS	71.6	10.881	2.793
Green leaf mulching 5 T / ha + Hand weeding 20 DAS	76.86	11.032	2.397
Weedy check	53.1	8.297	2.593
C.D.	13.55	2.472	0.809
SE(m)	4.42	0.807	0.264
SE(d)	6.25	1.141	0.374
C.V	10.38	12.04	15.503

Conclusion

Although all the treatments of weed management practices showed significant positive influence over control treatment in respect of growth parameters, T_3 (Mulching with biodegradable polythene sheet 25 DAS), T_1 [No mulch with weed management (hand weeding at every 15 days Interval)] and T_4 (Wheat straw mulch 5 T/ha + Hand weeding 20 DAS) perform comparatively better. Therefore from the investigation T_3 (Mulching with biodegradable

polythene sheet 25 DAS) are recommend as the best weed management practice in upland direct seeded rice.

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