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EFFECTS OF PLANT AND WEED RESIDUES ON THE GROWTH OF RICE

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Abstract

An experiment was carried out in plastic pots to examine the effect of plant residues of mesquite, lambsquarters, mundi flower and purple nutsedge on the growth of rice cv. Shadab. Incorporation of plant and weed residues increased plant height, number of tillers, dry matter wt., weight of earhead and straw and grain yields of rice as compared to control. Maximum yield in growth parameters were recorded when powdered leaf of lambsquarters was used.

Introduction

Plant residues from various sources constitute an important component of the soil. These plant materials in the form of living, dying and dead plant tissues, each with immense chemical diversity are finally decomposed in soil through the action of biotic and abiotic agencies (Bhagat & Verma, 1991; Schietzer & Khan, 1978; Khind *et al.*, 1987; Capriel *et al.*, 1992). It has been observed that incorporation of crop residues into the soil body not only plays an important role in the soils chemical and biochemical environment but also affects the rate at which nutrients become available to crop plants and to other forms of life in soil (Mogdoff & Amadon, 1980; Power & Legg, 1978). During the decomposition of crop residues many complex interactions, transformations and synthesis also occur. Thus, at any one time, the soil and the environment of plant roots could contain several chemical compounds and plant nutrients, many of which, no doubt, have important effects on all phases of plant growth and development (Ponnamperuma, 1984; Putnam, 1987). The most important aspect of the present study was to see the effects of different plants and weed residues on the growth and yield contributing characters of rice plants. The present report describes the effect of plant residues of mesquite, lambsquarters, mundi flower and nutsedge on the growth of rice cv. Shadab.

Materials and Methods

The alluvial nature of soil was collected from NIA Farm, Tando Jam having pH 7.7, N 0.075 %, available P 5.5 ppm and available K 150 ppm, total soluble salts (T.S.S) 2.0 dS/m, organic matter 1.1 % and $CaCO_3$ 8.9 %. The soil was classified as loamy soil.

The soil was air-dried, powdered and passed through a 2 mm sieve and 5 kg lots were transferred into plastic pots. Basal dressings of 100 kg N/ha and 50 kg P_2O_5/kg were applied to each pot. Powdered residue parts of mesquite, lambsquarters, mundi flowers and purple nutsedge was mixed @ 6 and 12 g/pot. A control treatment was also maintained without any plant residue. The required calculated amount of N and P fertilizers and individual plant residues from each source were mixed with the soil. The

Table 1. Effect of plant residues on the growth and yield of rice (cv. Shadab) recorded at 45 and 60 days of growth.

Treatment plant residue (g/pot)	45 days harvest			60 days harvest		
	Plant height (cm)	No. of tillers	Dry matter wt. (g)	Plant height (cm)	No. of tillers	Dry matter wt. (g)
Control (no residue)	60.36	5.94	6.15	63.33	2.75	10.51
Mesquite-6g (leaf)	64.31	6.13	9.91	70.30	3.90	16.29
Mesquite-12g (leaf)	93.75	6.94	8.85	72.92	3.80	14.46
Lambsquarters-6g (leaf)	68.87	7.40	10.08	80.17	4.11	18.55
Lambsquarters-12g (leaf)	62.88	6.80	9.40	69.25	3.95	14.80
Mundi flower-6g	60.85	6.63	8.95	67.83	3.00	11.55
Mundi flower-12g	55.62	5.63	5.33	63.00	3.92	10.70
Lambsquarters-6g (stem)	58.32	4.31	6.81	66.04	2.78	8.97
Lambsquarters-12g (stem)	59.82	6.88	6.82	69.54	3.50	10.41
Purple nutsedge-6g (leaf)	61.54	5.69	6.58	68.83	3.33	7.59
Purple nutsedge-12g (leaf)	62.54	5.13	7.35	69.58	3.42	9.21

Table 2. Effect of plant residues on the yield contributing characters of rice recorded at maturity.

Treatment plant residue (g/pot)	Final harvest at maturity						
	Plant height (cm)	No. of tillers	Wt. of earhead (g)	Straw wt. (g)	Total grain wt. (g)	100 grain wt. (g)	No. of grain
Control (no residue)	65.58	2.50	4.44	8.38	2.93	1.90	212.0
Mesquite-6g (leaf)	68.00	2.75	5.91	10.09	5.08	2.30	220.0
Mesquite-12g (leaf)	73.50	3.25	9.72	14.05	8.48	2.24	379.0
Lambsquarters-6g (leaf)	72.63	4.00	12.66	15.07	11.24	2.54	488.0
Lambsquarters-12g (leaf)	63.13	3.50	6.24	10.67	5.54	2.28	242.0
Mundi flower-6g	65.67	3.84	2.32	10.01	2.82	1.98	137.30
Mundi flower-12g	62.25	3.75	4.64	12.13	3.90	2.02	237.60
Lambsquarters-6g (stem)	67.75	2.63	4.60	8.17	3.64	2.24	272.00
Lambsquarters-12g (stem)	69.50	3.50	8.80	12.31	7.48	2.21	326.80
Purple nutsedge-6g (leaf)	72.50	3.63	7.44	12.98	7.33	2.34	279.80
Purple nutsedge-12g (leaf)	74.38	3.25	8.22	12.62	8.14	2.35	349.30

* The numbers 6 and 12 mentioned in the treatment column indicate the quantity of powdered material applied in the pots.

pots were watered for two weeks for mineralization and break down of the plant residues. Four weeks old rice seedlings cv. Shadab were transplanted @ 4 seedlings per pot. The pots were arranged in a randomized block design with four replications. All the pots were kept under submerged condition. After 45 days, the plant height and number of tillers were recorded. A second harvest was carried out after 60 days of growth and plant height and number of tillers were recorded. The rest of the plants were harvested at maturity after 125 days of growth period.

Results and Discussion

Incorporation of various types of plant residues in the soil considerably increased different plant growth parameters and yield contributing character of rice crop at all harvest occasions compared to control (Tables 1 & 2). At maturity (125 days of growth), maximum straw and grain yields were obtained by incorporating the residues of lambsquarters-6g (leaf), followed by mesquite-12g (leaf) and purple nutsedge-12g (leaf). The higher increase in grain and straw yields and other growth parameters with different plant residues may probably be due to differences in the physical and chemical nature of the substrates incorporated in the soil. The fertility of the soil increased due to break down of the residues incorporated in the soil.

The plant residues incorporated in soil, may have been a better supplier of plant nutrients through the mineralization and microbial decomposition of plant residues. It has been reported that soil microorganisms, which decompose and metabolize organic substances generally contribute to the storage and supply of important nutrients for crop plants such as N, P and other nutrients, which thereafter help in the growth and development of plants (Bhowmik & Doll, 1984; Colton & Einhellig, 1980). Most organic components of soil are decomposed into inorganic substances due to the action of soil enzymes (urease, hydrogenase) mainly released by microorganisms (Magdoff & Amadon, 1980; Ponnamperuma, 1984). It would suggest that the incorporation of plant residues into the soil is a good source for supplying the plant nutrient elements, which afterwards help in the growth and development of rice plant (Alam, 1993).

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