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Response of Turmeric to Planting Material and Mulching in the Hilly Region of Bangladesh

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Abstract: A field experiment was conducted at the Hill Agricultural Research Station, Khagrachari to find out a suitable planting material and mulch material for turmeric production in the hill slope of Chittagong Hill Tracts. Nine treatment combinations comprising 3 levels of planting material (mother rhizome, primary finger and secondary finger) and 3 levels of mulching (rice straw, sungrass and non-mulched) were compared. Mother rhizome showed better yield performance. Sungrass appeared the best mulching material for producing higher turmeric yield. Mother rhizome coupled with sungrass mulching gave significantly higher yields (387.6 g clump^{-1} and 29.4 t ha^{-1}) of turmeric in hilly region of Bangladesh.

Key words: Planting material, mulching, turmeric and *Curcuma longa*

Introduction

Turmeric (*Curcuma longa* L.) is one of the most important cash crop in the hilly region of Bangladesh. It is an integral part of daily curry preparation for its typical colour and flavour. Moreover, it is used in medicine and cosmetics and as dye in textile industries (Pruthi, 1976). Growers used the traditional Jhum cultivation for growing turmeric in hill slopes, which is very much hazardous for continuous crop production as because it enhances the soil erosion loss. Mulch is reported to conserve soil erosion, reduce soil temperature, minimize evaporation loss, reduced soil compaction, enhance root growth and suppress weed growth (Allamaras *et al*., 1977; Evanson and Rumbangh, 1972; Lal, 1983; Bhattacharyya and Rao, 1985). Straw is the most common mulch material in Bangladesh. But introduction of modern rice varieties and its use as cattle feed limits its use as mulch material. Sungrass is widely available in hilly areas and use as mulch material. But performance of these things as mulch materials yet not assessed in the locality.

Again, turmeric is propagated vegetatively by its finger or rhizomes. So, large quantity of seeds is required for planting per unit area. The seed requirement depends on the planting material. Various opinions are found regarding the planting material. Many researchers obtained higher yield with mother rhizome (Purseglove *et al.,* 1981; Barholia *et al*., 1992 and Chattopadhyay *et al*., 1990). The hilly farmers do not have proper knowledge about mulch use and planting material of turmeric for higher yield though hill tract are the vast potential area for growing turmeric. Since there is no sufficient research information regarding appropriate mulch material and propagative materials of turmeric. Hence the present experiment was designed to determine the effect of planting material and appropriate mulching materials on the growth and yield of turmeric in the hilly region.

Materials and Methods

The experiment was carried out at the Hill Agricultural Research Station, Khagrachari during the period from April 2000 to January 2001 and April 2001 to January, 2002 using the BARI released variety Dimla of turmeric. During the growing season of the crop, the average monthly minimum temperature was 12.8°C and maximum 31.9°C, relative humidity was 82.7% with a total rainfall of 2527.3 mm were recorded from the hill agricultural research station, Khagrachari during the growing season of 2000-01 and 2001-02. The experimental area was a fallow slope (about 20%) land. Slope of the land was measured by a framed level instrument (Zingg, 1940). The soil was developed from sandstone and silt stone sedimentary rocks with fairly low water holding capacity, having a pH 4.5 to 5.0 (Town, 1985). A two factor (viz. planting material and mulching) experiment was conducted in a randomized block design with three replications. The unit plot size and plant spacing were 4 x 1.5 m^2 and 50 x 25 cm^2, respectively. There were 9 treatment combinations comprising of 3 levels of planting material and also same levels of mulching materials. The treatments were:

Planting materials

P_1= Mother rhizome
P_2 = Primary finger
P_3 = Secondary finger

Mulching materials

M_1 =Rice straw

M_2 =Sungrass

M_3 =control (non-mulched)

Experimental plots were prepared by spading. Seeds were planted in a furrow of about 5 cm depth and 15 cm width covered with soil with no subsequent ridging. Urea, TSP, MP, Gypsum and Zinc oxide were applied @ 200, 170, 160,105 and 5 kg ha^{-1} respectively. The half of Urea and whole amount of all other fertilizers were applied during final land preparation and the remaining half of urea was top dressed in both year within 80-100 days after planting the seed. Mulch materials (10 t ha^{-1}) were applied in assigned plots just after planting the seeds.

Usual cultural practices were performed as and when necessary. Data were recorded from 10 randomly selected plants from each treatment. Morphological data were recorded at 6 months after planting and yield data were recorded just after harvesting. The yield ton ha^{-1} was calculated from the total yield $plot^{-1}$. Collected data were compiled for statistical analysis.

Results and Discussion

Effect of planting materials: Planting material of turmeric did not influence the yield components of turmeric except primary finger (Table 1). Mother rhizome gave significantly maximum number (8.40 $clump^{-1}$) and highest weight (159.13 g $clump^{-1}$) of primary finger while poor performance was obtained from secondary finger which was statistically identical with primary finger. Tyde and Deshmukh (1986) also reported similar results. Mother rhizome produced significantly higher yields (329.82 g $clump^{-1}$) over others. The yield per clump between primary and secondary fingers did not differ significantly. Similar trends were also observed in yield ton ha^{-1}.

This result is in agreement with that of Philip (1983) and Patil and Borse (1980) who observed that the mother rhizome gave higher yield of turmeric rhizome.

Effect of mulching materials: Mulching materials had not significant effect on yield components of turmeric except number of mother rhizome and weight of primary finger (Table 2). The highest number of mother rhizome (2.53 $clump^{-1}$) was obtained from sungrass while lowest number (1.70 $clump^{-1}$) was recorded in non-mulch (controlled) treatment. Similar trends were also observed in weight of primary finger $clump^{-1}$. In case of yield, better performances were found in mulched plots than non-mulched plots. Ash Worth and Harrison (1983) also have reported positive response to mulch. Halder *et al.* (2001) found the similar results in sapota. However, between the mulching material in the present study, sungrass gave significantly higher yield (329.96 g $clump^{-1}$ and 25.05 t ha^{-1}) over rice straw, it might be due to the reason that sungrass were comparatively more compactness than rice straw and were retained for longer period which ensured a steady supply of soil moisture during drier period. The lowest total yield (262.80 g $clump^{-1}$ and 19.95 t ha^{-1}) was recorded from non-mulched plots which was significantly at par with rice straw mulched plot.

Interaction effect: The yield and yield components of

Table 1: Yield and yield components of turmeric as influenced by planting materials (Average of 2000-01 and 2001-02)

				Mother rhizome $clump^{-1}$		Primary finger $clump^{-1}$		Secondary finger $clump^{-1}$			
Treatments	Plant height (cm)	Leaves $clump^{-1}$	Tillers $clump^{-1}$	No.	wt.(g)	No.	wt. (g)	No.	Wt. (g)	Yield $clump^{-1}$ (g)	Yield ha^{-1} (ton)
P_1	96.33	18.26	3.70	2.29	78.76	8.40a	159.13a	18.06	91.88	329.82a	25.04a
P_2	87.66	15.93	3.16	2.23	70.77	7.60b	138.33b	16.66	90.25	300.47b	22.81b
P_3	79.00	14.33	2.66	1.77	55.23	6.17b	120.40b	14.40	78.50	254.13b	19.31b
F-Test (P < .05)	NS	NS	NS	NS	NS	*	*	NS	NS	*	*

* Means followed by same letter in a column do not differ significantly at 5% level of probability

NS - Non significant P_1 =Mother rhizome P_2 =Primary finger P_3 =Secondary finger

Table 2: Yield and yield components of turmeric as influenced by Mulch materials (Average of 2000-01 and 2001-02)

				Mother rhizome $clump^{-1}$		Primary finger $clump^{-1}$		Secondary finger $clump^{-1}$			
Treatments	Plant height (cm)	Leaves $clump^{-1}$	Tillers $clump^{-1}$	No.	wt.(g)	No.	wt. (g)	No.	Wt. (g)	Yild $clump^{-1}$ (g)	Yield ha^{-1} (ton)
M_1	88.35	16.20	3.33	2.06b	66.80	7.33	136.80b	16.30	86.94	291.67b	22.15b
M_2	96.66	17.70	3.50	2.53a	81.62	8.37	157.10a	18.00	91.23	329.96a	25.05a
M_3	76.71	14.63	2.70	1.70b	56.35	6.46	124.00b	14.84	82.46	262.82b	19.95b
F-Test (P<0.05)	NS	NS	NS	*	NS	NS	*	NS	NS	*	*

* Means followed by same letter in a column do not differ significantly at 5% level of probability

NS = Non significant M_1 =Rice Straw M_2 =Sun grass M_3 =Control

Table 3: Yield and yield components of turmeric as influenced by the combined effect of planting and mulching materials (Average of 2000-01 and 2001-02)

Treatments	Plant height (cm)	Leaves clump^{-1}	Tillers clump^{-1}	Mother rhizome clump^{-1}		Primary finger clump^{-1}		Secondary finger clump^{-1}		Yield clump^{-1} (g)	Yield ha^{-1} (ton)
				No.	wt.(g)	No.	wt. (g)	No.	Wt. (g)		
P_1M_1	96ab	18.7ab	3.90ab	2.08bc	71.0bcd	8.1bc	135.4b	17.6b	83.3bc	311.0bc	23.63bc
P_1M_2	109a	19.6a	4.20a	2.90a	98.6a	9.6a	189.1a	20.4a	103.2a	387.6a	29.4a
P_1M_3	84b-e	16.5bcd	3.00cd	1.90cd	66.7cde	7.5bcd	135.0bcd	16.2bc	89.2ab	290.9b-e	22.1b-e
P_2M_1	89bcd	15.9cde	3.20cd	2.30bc	73.6bc	7.8bc	139.0bc	16.9bc	93.0ab	305.6cd	23.2bcd
P_2M_2	95abc	17.8abc	3.50bc	2.70a	84.1ab	8.5ab	148.7b	17.8ab	87.3b	323.5b	24.6b
P_2M_3	79d	14.1def	2.80de	1.70de	54.6ef	6.5def	127.3cde	15.5bcd	90.4ab	272.27de	20.7de
P_3M_1	81cde	14.0ef	2.90d	1.80cde	55.8ef	6.1ef	118.0de	14.4cd	84.5b	258.3ef	19.6ef
P_3M_2	86bcd	15.7c-f	2.80de	2.01bcd	62.1c-f	7.0cd	133.5bcd	15.8bc	83.2bc	278.8cde	21.2cde
P_3M_3	70e	13.3f	2.30e	1.50e	47.8f	5.4f	109.7e	13.0d	67.8c	225.3f	17.1f
F-Test (P<0.05)	*	*	*	*	*	*	*	*	*	*	*
CV (%)	16.13	15.38	18.35	16.81	22.04	16.00	14.01	16.01	18.22	11.21	11.45

* Means followed by same letter in a column do not differ significantly at 5% level of probability NS - Not significant

turmeric were significantly influenced by planting material and mulching material (Table 3). The maximum plant height (109.0 cm) was recorded from mother rhizome when mulched with sungrass. The minimum plant height (70.0 cm) was observed in secondary finger with non-mulched treatment. More or less similar trends were found in all yield contributing characters. The mother rhizome coupled with sungrass mulching gave significantly higher yield (387.6 g clump^{-1} and 29.4 t ha^{-1}) and the lowest yield (225.3 g clump^{-1} and 17.1 t ha^{-1}) of turmeric was recorded from secondary finger with non-mulched treatment. The results indicated that mother rhizome was suitable for turmeric production in the Chittagong hill tracts region combination with sungrass mulching.

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