

Effect of Tillage and Mulch on the Growth and Yield of Ginger in the Hilly Area

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Abstract: The experiment was conducted to find out the effect of three different tillage practices such as zero (dibbling), furrow and conventional (spading) and mulching (mulch, no mulch) on the growth and yield of ginger. Tillage practices and mulching showed significant influence on the growth, yield and yield components of ginger. The highest yield (18.75 t/ha) was recorded from zero tillage which was significantly different from other tillage practices. Significantly higher yield (17.87 t/ha) was obtained from the mulched plants than that of unmulched plants (11.85 t/ha). In case of, combined effect, the most satisfactory yield (22.36 t/ha) was found in the zero tillage with mulch while the lowest yield (9.41 t/ha) was in conventional tillage with no mulch.

Key words: Tillage, mulch, ginger, Hilly area

Introduction

In the hills, ginger is usually planted in furrow with subsequent ridging or in jhum field. As most of the land in the hilly area are slopy, conventional tillage operation is very much detrimental as accelerates soil erosion. Research work carried out on different crops in the hill slopes, revealed that zero tillage gave significantly higher yield of cowpea (Uddin and Sattar, 1989), ginger (Rahman *et al.*, 1988) and Mukhi Kachu (Alam and Rahman, 1988). The benefits of no-tillage farming in the hilly region includes improve soil and moisture conservation, increased moisture regimes and reduced soil compaction Lal (1976, 1983). Blevins *et al.* (1971) also stated that no tillage practice has an appeal to the farmers since it reduces labour cost. Ginger has to face severe drought during the maximum vegetative stage and also maturity stage. Because it is grown in rainfed condition. This situation has great effect on the yield and quality of ginger. We can overcome this situation by using mulch. It also help to lessen the growth of weed. Mulching has various effects on soil and plants. Mulching improves soil conservation and reduces soil compactness (Lal, 1980). Besides, mulching is reported to conserve soil moisture, reduce soil temperature, minimize evaporation loss and enhance root growth (Chowdhury and Prihar, 1974). Moisture distribution in the upper soil layer is more uniform compared with unmulched soil and more roots developed in the upper soil layer which usually has richer nutrients and useful micro organisms (Knave and Mohr, 1967). Growers of this area cultivate ginger without maintaining any soil conservation and cultural practices. In this aspect, the present study was carried out to find out the suitable tillage practice and response of ginger to mulch.

Materials and Methods

The study was conducted at the Hill Agricultural Research Station, Khagrachari from April to December, 1997, 1998 and 1999 respectively. Locally collected ginger was planted for this purpose. The factorial experiment was designed at randomized complete block design with three replications. The treatment consists of three tillage practices viz., zero(dibbling), furrow and conventional (spading) and with or without mulching. Seed rhizomes were planted at first week of April each year at 50 X 25cm² spacing between and within the rows. The unit plot size was 10.0 X 3.0m². The land was prepared and fertilized with cowdung, Urea, TSP, MP and Gypsum @ 10t, 304, 267, 233 and 111kg/ha respectively. The entire quantity of cowdung, TSP, gypsum and half of MP were applied during land preparation. The half of urea were top dressed at 50 days after planting. Remaining MP & urea was applied in two equal splits at 80 and 110 days after planting. Intercultural operations were done as and when necessary. Harvesting was done at 9 months after planting. Data on different parameters of vegetative growth and fresh

rhizome of ginger were recorded and analyzed following the standard statistical procedure. Test of significance was performed by F-test. The difference among the treatments mean were judged by LSD.

Results and Discussion

Main effect of tillage: Tillage practices had a significant influence on the yield and yield components except number of mother rhizome (Table 1). The highest plant height (65.81 cm) was found in zero tillage which was statistically identical to furrow tillage (50.27) and the lowest (44.40 cm) was in conventional tillage. Number of leaves were highest (21.97) in zero tillage which was significantly different from furrow (18.50) and conventional tillage (15.03). Zero tillage also gave higher number (11.27) of tillers over furrow (9.06) and conventional tillage (8.16). The maximum weight (44.65 g) of mother rhizome was found in zero tillage while the lowest (29.53 g) in conventional tillage. The highest number and weight of primary and secondary rhizome (7.23, 81.75 g and 13.65, 121.34 g respectively) was recorded from zero tillage and the lowest (4.95, 54.13 g and 9.56, 80.38 g respectively) in conventional tillage. The highest yield (246.91g) per plant was obtained from zero tillage which was statistically different from furrow (183.94 g) and conventional tillage (164.05 g). Among the tillage practices, the highest yield (18.75 t/ha) was observed in zero tillage which was significantly different from both furrow (13.71 t/ha) and conventional tillage (12.12 t/ha). Similar result was reported by Rahman *et al.* (1988). Awal *et al.* (1978) also found same result in Mukhi Kachu.

Main effect of mulch: Mulching showed a significant effect on the yield and yield components of ginger except number of tillers and number of mother rhizome (Table 1). Mulch treated plants showed significantly higher plant height, number of leaves, weight of mother rhizome, number and weight of primary and secondary rhizome, yield per plant of ginger over unmulched plants. Mulched plants produced the higher yield (17.87 t/ha) as compared to the plants with no mulch (11.85 t/ha). Positive response of mulch has also been reported by Ashworth and Harrison (1983). This response was probably due to weed control, reduction of nutrient loss by leaching, retention of soil heat and conservation of soil moisture.

Combined effect of tillage and mulch: The yield components and yield of ginger were significantly influenced by the combined effect of tillage and mulch (Table 2). The highest yield (292.08 g) per plant was recorded from the treatment combination of zero tillage with mulch while the lowest yield (130.21 g) was obtained from the combination of conventional tillage with no mulch. The most satisfactory yield (22.36 t/ha) was

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Table 1: Main effect of tillage and mulch on the yield components and yield of ginger (Average for three years)

Treatments	Plant height(cm)	Number of leaves per plant	Number of tillers per plant	Mother rhizome		Primary rhizome		Secondary rhizome		Yield/ plant(g)	Yield (t/ha)
				No.	Wt.(g)	No.	Wt.(g)	No.	Wt.(g)		
Tillage											
T ₀	65.81	21.97	11.27	1.66	44.65	7.23	81.75	13.65	121.3	2446.91	18.75
T ₁	50.27	18.50	9.06	1.53	33.11	6.10	60.69	11.21	90.13	183.94	13.71
T ₂	44.40	15.03	8.16	1.38	29.53	4.95	54.13	9.56	80.38	164.05	12.12
LSD (0.05)	8.23	5.01	2.63	-	7.62	1.87	12.53	2.36	13.25	33.36	3.42
LSD(0.01)	18.98	-	-	-	-	-	-	31.04	76.96	-	-
Mulch											
M	60.73	21.13	9.84	1.61	42.60	6.62	78.03	12.41	115.85	235.92	17.87
N	46.25	15.86	9.15	1.44	28.93	5.57	53.02	10.54	78.72	160.67	11.85
LSD (0.05)	9.23	3.43	-	-	11.65	0.93	13.62	1.02	15.53	35.72	4.01
LSD (0.01)	-	-	-	-	-	-	22.76	-	33.42	72.21	-

T₀ = Zero tillage(dibbling), T₁ = Furrow tillage, T₂ = Conventional tillage (Spading), M = Mulch, N = No Mulch

Table 2: Combined effect of tillage and mulch on the yield components and yield of ginger (Average for three years)

Treatments	Plant height (cm)	Number of leaves per plant	Number of tillers per plant	Mother rhizome		Primary rhizome		Secondary rhizome		Yield/ plant (g)	Yield (t/ha)
				No.	Wt.(g)	No.	Wt. (g)	No.	Wt.(g)		
M x T ₀	69.10	25.37	11.97	1.77	52.97	7.70	96.92	14.20	143.85	292.08	22.36
T ₁	60.23	21.67	9.10	1.58	39.21	6.54	71.87	12.23	106.73	217.81	16.42
T ₂	52.87	16.37	8.46	1.49	35.62	5.63	65.30	10.80	96.97	197.89	14.83
N x T ₀	62.53	18.57	10.57	1.59	36.34	6.77	66.58	13.10	98.84	201.75	15.14
T ₁	40.31	15.33	9.03	1.48	27.02	5.67	49.52	10.20	73.53	150.07	11.00
T ₂	35.93	13.69	7.87	1.27	23.44	4.27	42.97	8.33	63.80	130.21	9.41
LSD (0.05)	6.03	3.67	1.93	0.24	5.58	1.37	9.18	1.73	9.85	24.43	2.51
LSD (0.01)	8.57	5.22	2.74	0.34	7.94	1.95	13.06	2.46	14.02	34.75	3.57
CV(%)	6.19	10.90	11.15	8.48	8.58	12.35	7.70	8.27	5.57	6.77	9.28

Table 3: Economics of producing ginger under tillage and mulch condition

Treatments	Gross return(Tk/ha)	TVC (Tk/ha)	Net return (Tk/ha)	Benefit cost ratio (BCR)
M x T ₀	335400	81926	253474	4.09
T ₁	246300	88926	157374	2.77
T ₂	222450	86426	136024	2.57
N x T ₀	227100	80526	146574	2.82
T ₁	185000	78026	86974	2.11
T ₂	141150	73526	67624	1.92

*TVC (Total variable cost including cost of seeds, fertilizer and human labour) *Human labour : Tk. 50/ labour, Seeds cost : Tk. 42/kg, Mulch materials : Tk. 8,000/ha, Farmgate rhizome price : Tk. 15/kg.

recorded from mulch with zero tillage which was statistically different from the yield of all other treatment combinations. Because, all the yield contributing components showed vigorous performance on the mentioned treatment combination. As a result, higher amount of photosynthates were accumulated on the lower portion of the plant. It might be due to least soil erosion and preservation of the fertility gradients. Similar results were reported by Jha *et al.* (1986). On the other hand, the lowest yield (9.41 t/ha) was recorded from no mulch with conventional tillage. This might be due to the direct hit of rain drops on the soil surface which resulted in nutrients leaching. Yield increased in the difference of tillage with mulch but proportionate to zero tillage followed by furrow and conventional tillage.

Economics: The highest gross return (Tk. 33,5400/ha), net return (Tk. 253474/ha) and BCR (4.09) were recorded in mulch with zero tillage treatment combination and the lowest (Tk. 141150, Tk. 67624 and 1.92 respectively) in no mulch with conventional tillage combination (Table 3). All the mulched treatments gave the higher

net profit and BCR over unmulched treatments. The present study indicates that mulch and tillage practices have significant influence on the growth and yield of ginger.

It can be concluded that zero tillage with mulch is the best production technology of ginger cultivation in the hilly area under Bangladesh condition.

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