Journal of Spices and Aromatic Crops 10 (1) : 13-16 (2001)

Effect of mulching on yield of ginger (*Zingiber officinale* Rosc.)

Ram Chandra[1] & Sheo Govind

I. C. A. R. Research Complex for N. E. H. Region
Umiam – 793 103, Meghalaya, India.

Received 22 May 2000; Revised 06 November 2001; Accepted 12 November 2001.

Abstract

Field experiments were conducted at Barapani, Meghalaya to evaluate the response of ginger to the application of locally available organic mulches. Five treatments namely, paddy straw mulch, *Schima wallichii* dry leaf mulch, *Eupatorium odoratum* green stem and leaf mulch, *Pinus kesia* dry leaf mulch and unmulched control were compared in the present study. Use of organic mulches enhanced the sprouting, reduced the dry matter accumulation by weeds and improved the growth and yield of ginger significantly. Paddy straw and *Schima* leaves were superior as these mulches increased the yield by 43.6% and 39.7% over control, respectively.

Key words : ginger, organic mulch, weed biomass, yield, *Zingiber officinale.*

Introduction

Ginger (*Zingiber officinale* Rosc.) is one of the important cash crops grown in Meghalaya. Mulching in ginger is a common practice in many parts of India and its beneficial effects in enhancing sprouting, reducing soil erosion, conserving moisture, adding organic matter, improving temperature and physical properties of soil and minimizing weed competition in rhizomatous crops have been reported under various agro-climatic situations by several workers (Aiyadurai 1966; Mohanty 1977; Jha *et al.*1986; Mohanty et *al.* 1991; Gill *et al.* 1999). Tree leaf mulch (Jha *et al.* 1986; Babu & Jayachandran 1997) and straw mulch (Gill *et al.* 1999) significantly increased the yield of rhizomatous crops in India. In Sikkim, ginger beds are covered by leaves and twigs of various forest trees after sowing. Besides, weeds and paddy straw are also used as mulch materials and their quantity varies from 5-20 t ha^{-1} (Patiram *et al.* 1995). Contrary to this, mulching is not a common practice in East Khasi Hills, but traditionally *bun* farming is practised where farmers burn dry grasses (30-45 t ha^{-1}) on the beds (Chandra 1996). *Bun* farming not only improves the soil fertility but also controls weeds. However, for this purpose a huge quantity of dry grasses, collected from the forest or waste lands, are used which leads to soil erosion. In view of these, the present experiment was conducted to see the effect of different mulches for a sustainable production of ginger.

Materials and methods

The field experiments were conducted at Barapani, ICAR Research Complex for N. E. H. Region, Meghalaya, during 1997-99 on terraced land having alfisol soil with pH 5.08, total N 1.35%, organic carbon 2.46%, available P 2.20 kg ha^{-1} and available K 63 kg ha^{-1}. Five mulches namely, paddy straw, *Schima wallichii* leaves, *Eupatorium odoratum* green stem and leaves, *Pinus kesia* dry leaves were tried. The experi-

[1]National Research Centre for Medicinal and Aromatic Plants, Anand – 387 310, Gujarat

ment was conducted in a randomized block design with four replications. Mulch @ 16 t ha^{-1} was used. The net plot size was 0.9 x 1.8 m with a gross plot size of 2.52 m^2. Ginger rhizomes were sown at a spacing of 30 cm x 30 cm in the last week of April in both the years. A fertilizer dose of 100 kg each of N, P and K ha^{-1} was applied in split doses. Twenty five per cent of nitrogen and fifty per cent of phosphorous and potash were incorporated at the time of planting. The remaining P and K were applied at 60 days after planting (DAP). The rest 25 percent of nitrogen was top dressed at 90 DAP. Well rotten cowdung (25 t ha^{-1}) was mixed in the beds before planting. Weeds from each treatment were collected from the net plot at 45, 90, 135 and 180 DAP and these samples were sun dried for recording weed dry matter. The number of sprouts were counted from each plot at 50 DAP. Growth parameters were recorded in the first week of November. The crop was harvested in the first week of January and yield per hectare was estimated.

Results and discussion

Application of mulch enhanced the sprouting of ginger rhizomes and minimized weeds in both the years (Table 1). Sprouting was significantly increased over control due to mulching and were on par in all the four

Table 1. Influence of mulching on sprouting and weed biomass production in ginger

Parameters	Year	Treatment					LSD (P=0.05)
		T_1	T_2	T_3	T_4	T_5	
Sprouting (%) 50 DAP	1997-98	60.2	78.4	82.6	76.2	70.8	8.12
	1998-99	52.8	75.0	76.4	70.8	72.2	7.20
	Mean	56.5	76.7	79.5	73.5	71.5	—
Weed biomass (g $plot^{-1}$)							
45 DAP	1997-98	865.2	210.6	148.5	206.8	184.8	65.32
	1998-99	640.0	125.0	75.0	120.0	125.0	49.85
	Mean	752.6	167.8	11.8	163.4	154.9	—
90 DAP	1997-98	148.6	49.8	86.8	78.4	52.6	31.20
	1998-99	85.0	36.3	67.5	47.5	32.5	26.13
	Mean	116.8	43.1	77.2	63.0	42.6	—
135 DAP	1997-98	86.8	100.2	110.8	120.4	63.4	23.42
	1998-99	40.0	53.8	56.3	68.8	28.8	19.54
	Mean	63.4	77.0	83.6	94.6	46.1	—
180 DAP	1997-98	93.4	120.2	80.6	93.2	110.6	28.61
	1998-99	48.8	67.5	45.0	52.5	72.5	20.24
	Mean	71.1	93.9	62.8	72.9	91.6	—
Total	1997-98	1194.0	480.8	426.7	498.8	411.4	61.25
	1998-99	813.8	282.5	243.8	288.8	258.8	48.91
	Mean	1003.9	381.65	335.3	393.8	335.1	—

DAP=Days After Planting

T_1 Control; T_2 Paddy straw mulch; T_3 *Schima wallichii* dry leaf mulch; T_4 *Eupatorium odoratum* green stem & leaf mulch; T_5 Khasi pine dry leaf mulch.

organic mulches tested. The increase in sprouting due to mulching might be due to reduction in the rate of evaporation of soil moisture. In general, the dry matter accumulation by weeds was high in all plots till 45 DAP and there after weed infestation was reduced. The total weed biomass production (1194.0 g plot^{-1}) was highest in control (unmulched) plots compared to mulched plots, indicating that organic mulches have suppressed the growth of weeds and thus minimized the crop-weed competition. Similar result was reported in turmeric, grown under rainfed condition in Orissa by Mohanty *et al.* (1991).

All the growth parameters namely, number of tillers and leaves per clump and size of leaf, except plant height were significantly increased by mulching compared to control (without mulch) (Table 2). Application of organic mulches increased the fresh rhizome yield of ginger significantly as compared to no mulch (Table 2). Paddy straw and *S. wallichii* leaf mulches have significantly increased the rhizome yield (43.6% and 39.7% over control, respectively), which are on par. Similarly, increases of 30.4% and 22.7% in yield were recorded with *Eupatorium* and Khasi pine mulches. The higher rhizome yield with organic mulches was due to the improved growth attributes, reduced competition by weeds and improved soil conditions. Tree leaf and paddy straw as mulch have been reported to increase the yield of ginger in Bihar (Jha *et al.* 1986). Paddy straw and *Schima* leaves can be used as mulch for sustainable production of

Table 2. Influence of mulching on growth and yield of ginger

Plant character	Year	Treatment					LSD (P=0.05)
		T_1	T_2	T_3	T_4	T_5	
Plant height (cm)	1997-98	82.24	86.45	87.12	86.50	86.02	N. S.
	1998-99	77.48	78.75	78.35	77.88	77.71	N. S.
	Mean	79.86	82.60	82.74	82.19	81.87	—
Number of tillers clump^{-1}	1997-98	5.26	9.22	8.51	7.92	7.68	0.65
	1998-99	4.53	6.35	5.73	5.28	5.20	0.36
	Mean	4.90	7.79	7.12	6.60	6.44	—
Number of leaves clump^{-1}	1997-98	75.60	110.27	106.45	104.20	97.63	6.28
	1998-99	67.40	85.85	83.20	77.00	74.03	4.04
	Mean	71.50	98.06	94.83	90.60	85.83	—
Leaf length (cm)	1997-98	25.32	27.50	26.94	26.80	26.45	0.49
	1998-99	24.97	26.74	25.78	25.62	25.32	0.37
	Mean	25.15	27.12	26.36	26.21	25.89	—
Leaf width (cm)	1997-98	2.82	3.04	2.89	3.00	2.90	0.29
	1998-99	2.35	2.73	2.69	2.83	2.63	0.24
	Mean	2.59	2.89	2.79	2.92	2.77	—
Fresh rhizome yield (q ha^{-1})	1997-98	170.40	238.92	230.95	220.63	198.4	9.65
	1998-99	156.80	230.16	225.46	205.52	202.38	18.28
	Mean	163.35	234.54	228.21	213.08	200.39	—

T_1 Control; T_2 Paddy straw mulch; T_3 *Schima wallichii* dry leaf mulch; T_4 *Eupatorium odoratum* green stem & leaf mulch; T_5 Khasi pine dry leaf mulch.

ginger in Meghalaya since they decompose easily compared to pine leaves and *Eupatorium* biomass. Moreover, these mulches are locally available in forest and wastelands.

Acknowledgements

The authors are grateful to the Director, ICAR Research Complex for N. E. H. Region for the facilities provided. Thanks are due to Miss. P. U. Pandit, Technical Assistant, NRC for Medicinal and Aromatic Plants, Anand for statistical analysis.

References

Aiyadurai S G 1966 A Review of Research on Spices and Cashew in India, Indian Council of Agricultural Research, New Delhi.

Babu P & Jayachandran B K 1997 Mulch requirement of ginger (*Zingiber officinale* Rosc.) under shade. J. Spices & Aromatic Crops 6 : 141-143.

Chandra R 1996 Growth and yield of ginger as influenced by method of planting, seed rate and removal of old rhizomes. J. Plantn. Crops 24 (suppl.) : 116-119.

Gill B S, Randhawa R S, Randhawa G S & Singh J 1999 Response of turmeric (*Curcuma longa* L.) to nitrogen in relation to application of farm yard manure and straw mulch. J. Spices & Aromatic Crops 8 : 211-214.

Jha R C, Maurya K R & Pandey R P 1986 Influence of mulches on the yield of ginger in Bihar. Indian Cocoa Arecanut & Spices J. 9 (4) : 87-90.

Mohanty D C 1977 Studies on the effect of different mulch materials on the performance of ginger in the hills of Pottangi. Orissa J. Hort. 5 (12) : 11-17.

Mohanty D C, Sarma Y N & Panda B S 1991 Influence of mulch materials and cover crops on the yield of turmeric crop under rainfed condition in Orissa. Indian Cocoa Arecanut & Spices J. 14 (3) : 97-99.

Patiram, Upadhyaya R C & Singh L N 1995 An appraisal of ginger (*Zingiber officinale* Rosc.) production in Sikkim. Indian J. Spices & Aromatic Crops 4 (2) : 111-118.