Current Horticulture 11(2): 64–66, May–August 2023 DOI: 10.48165/chr.2023.11.2.8

Management of weed diversity through organic mulching and alternative weed suppression practices on ginger (*Zingiber officinale*)

Binoy Chhetri[1]*, Sanjivani Karki[2], S. K. Mahato[1], S. Gurung[1], and B.R. Sharma[1]

Uttar Banga Krishi Viswavidyalaya, Kalimpong, West Bengal 734 301, India

Received: 12 June 2021; **Accepted:** 8 March 2022

ABSTRACT

A field experiment was conducted at the Regional Research Station (Hill Zone), Uttar Banga Krishi Viswavidyalaya, Kalimpong, Darjeeling, West Bengal, during 2019 and 2020 to study the effect of weed diversity, growth and yield of ginger (*Zingiber officinale* Rose) as influenced by organic mulching and alternative weed management practices. The randomized block design, having seven varying treatments with three replications was used. The treatments consisted of dry weed biomass mulch @ 5.0 t/ha (T_1), paddy straw mulch @ 5.0 t/ha (T_2), FYM Mulch @ 5.0 t/ha (T_3), dry leaves of *Schima wallichi*@ 5.0 t/ha (T_4), dry leaves of *Artimesia* sp. and *Eupatorium* sp. @ 5.0 t/ha (T_5), hand weeding (twice) at 45 and 90 DAS (T_6) and unweeded control (T_7). The result showed that hand weeding twice at 45 and 90 DAS (T_6) appreciably reduced the total weed population/m^2 and total dry weight of weeds than unweeded control plot (T_7) at all the stages of crop growth. The highest plant height (82.10 cm), number of leaves/clump (65.41), number of pseudostem/clump (5.17), rhizome length (7.22 cm), rhizome width (5.50 cm), number of fingers/rhizome (6.42), yield/plant (0.268 kg/plant), yield (20.33 t/ha) and weed control efficiency were recorded under the hand weeding twice at 45 and 90 DAS (T_6) compared to other treatments. The results showed that it is necessary to cover the soil surface with different mulch materials and manual weed control practices to achieve a good control of weeds along with enhanced yield attributes.

Key Words: FYM, Mulch, Dry weeds, Yield, Weeds, Weed biomass, Pseudostem

Ginger (*Zingiber officinale* Rose) is an important commercial spice crop. Weeds compete with ginger for nutrients, moisture and space, causing 35-75% yield reduction. However, environmental condition of hilly regions of Kalimpong and adjoining areas is characterized by moderate temperature and high rainfall which is highly conducive for year round emergence and growth of highly competitive perennial and annual weed species, *Cynodon* spp., *Cyprus* spp., *Digitaria* spp., *Eleusina indica, Imperata cylindrica, Commelina* spp., *Bidens pilosa, Amaranthus species, Physalis minima, Spilanthes acmella, Sida acuta, Solanum nigrum, Polygonum* and *Ageratum conyzoides* (Sah *et al*. 2017, Choudhary and Kumar 2019). In spite of diverse and highly competitive weed flora existing in ginger-growing areas, information on weed management in ginger is not available. Mulching has a positive effect on micro climate of soil (Bu *et al*. 2002) and increase the yield (Choudhary *et al*. 2013). The surface application of mulch favourably influences weed flora by suppressing their emergence and subsequent growth (Lalitha *et al*., 2001, Choudhary and Kumar 2019), and may also provide the nutrients by microbial decomposition of organic mulches (Ghosh *et al*., 2006). Therefore, the present study was carried out on handweeding and spreading of FYM, dry leaves of tree species and dry weed biomass mulch for optimum growth and yield of ginger.

*Corresponding author : yonib2050@gmail.com

MATERIAL AND METHODS

The experiment was conducted at Regional Research Station (Hill Zone), Uttar Banga Krishi Viswavidyalaya, Kalimpong, West Bengal, during 2019 and 2020. The randomized block design, having seven varying treatments with three replication was used. The treatments consisted of dry weed biomass mulch @ 5.0 t/ha (T_1), paddy straw mulch @ 5.0 t/ha (T_2), FYM Mulch @ 5.0 t/ha (T_3), dry leaves of *Schima wallichi* @ 5.0 t/ha (T_4), dry leaves of *Artimesia* sp. and *Eupatorium* sp. @ 5.0 t/ha (T_5), hand weeding (twice) at 45 and 90 DAS (T_6) and unweeded control (T_7). Weed flora in experimental field was identified and their sequence of appearance, emergence profile and special characteristic feature were also noted by regular survey on weeds throughout the growing period. The effect of organic mulching and alternative weed management practices over weeds of ginger were analyzed taking consideration of total weed populations, total dry weight of weeds, weed control efficiency and yield components and yield.

Weed suppression efficiency was calculated from following formula and it is expressed in %.

$$\text{WSE}= \frac{\text{Weed dry weight in control plot (unweeded)- weed dry weight in treated plot}}{\text{Weed dry weight in control plot (unweeded)}} \times 100$$

Weed Index (WI) is a measure of efficacy of particular treatment compared with weed free treatment and is expressed as percentage of yield potential under weed free.

$$\text{Weed index} = \frac{X - Y}{X} \times 100$$

where, X - Yield from weed free and Y - Yield of a particular treatment

RESULT AND DISCUSSION

The plant height was significantly different among all the treatments during both the years. However, plant height indicated significant variation over the control treatment. The hand weeding twice at 45 and 90 days after sowing resulted in higher plant height (82.92, 81.27 and 82.10 cm). This might be due to removal of all the weeds by hand which helps to develop suitable environment for root growth and improve micro environment for their growth. It was lowest under without mulch and handweeding (68.81, 67.23 and 68.02 cm) (T_7). Weed management practices by mulching, FYM and dry leaves of *Schima wallichi* and *Eupatorium* mulch significantly influenced plant height of ginger than other mulching materials. The highest plant height was noted under FYM mulch (80.23, 79.88 cm and 80.06) (T_3), followed by dry leaves of *Schima wallichi* and *Eupatorium* (78.69, 77.88 and 78.29 cm) (T_4).

Highest number of pseudostems was noted under hand weeding twice at (45 and 90 DAS) (5.16, 5.18 and 5.17) (T_6). The increase in number of pseudostem might be owing to less crop weed competition for nutrients, space, light and moisture. Weed management practices by different mulch materials, FYM mulch (5.01, 4.96 and 4.99) (T_3) produced more number of pseudostem, followed by dry leaves of *Schima wallichi* and *Eupatorium* (4.88, 4.82 and 4.85) (T_4) than other treatments. This might be due to spreading of FYM as mulch materials not only reduced the weed growth but also supply macro and nutrients to plants. The lowest number of pseudostem was recorded under the control treatment (4.45, 4.42 and 4.44) (T_7).

The hand weeding twice at 45 and 90 days after recorded maximum number of leaves/clump (65.95, 64.86 and 65.41) (T_6). The increase in number of leaves/clump might be due to increase in growth of crop. However, different weed management by FYM mulch produced more number of leaves/clump (63.73, 62.89 and 63.31) (T_3), followed by dry leaves of *Schima wallichi* and *Eupatorium* (61.45, 60.64 and 61.05) (T_4) and lowest was recorded under treatment without weeding and mulch (53.82, 52.95 and 53.38) (T_7).

The weed management practices by manual hand weeding resulted in maximum rhizome length (7.31, 7.15 and 7.22 cm), rhizome width (5.51, 5.48 and 5.50 cm) and number of fingers/rhizome (6.56, 6.28 and 6.42) (T_6) compared to other treatment. This might be due to manual hand weeding not only removal of weeds but also loosening and pulverised soil which ultimately enhances the rhizome length, width and number of finger per rhizome. However, weed management practices by FYM mulch recorded highest rhizome length (7.01, 6.82 and 6.91 cm), rhizome width (5.30, 5.24 and 5.27 cm) and number of fingers/rhizome (6.23, 6.02 and 6.12) (T_3), followed by dry leaves of *Schima wallichi* and *Eupatorium* (rhizome length 6.71, 6.50 and 6.61 cm, rhizome width 5.09, 5.03 and 5.06 cm and number of finger/rhizome 5.92, 5.63 and 5.78) (T_4). The increase in rhizome length, width and number of fingers/rhizome might be due to uniform germination, moisture conservation in soil, available nutrients and less crop weed competition than other treatments. The lowest rhizome length (4.96, 4.81 and 4.89 cm), width (4.01, 3.99 and 4.00 cm) and number of fingers/rhizome (4.60, 4.48 and 4.54) were noted under control (without hand weeding and mulch) (T_7).

The highest yield (269, 266 and 268 g/plant) (20.56, 20.09 and 20.33 t/ha) was noted under handing weeding twice (T_6). The increase in yield might be

Table 1: Effect of weed management on yield, weed control efficiency and weed index

Treatment	Yield/ plant (g)		Yield tonnes/ha		Weed control efficiency (%)				Weed index	
			45 days after sowing		90 days after sowing					
	YI	YII	YI	YII	YI	YII	YI	YII	YI	YII
TI	241	237	15.54	15.11	46.82	45.37	45.62	45.85	24.42	24.77
T2	235	230	15.11	14.97	45.90	43.24	43.12	42.70	26.51	25.47
T3	258	255	18.30	18.04	68.09	62.99	60.80	60.61	10.99	10.20
T4	251	249	17.05	16.59	56.79	54.03	50.35	50.95	17.09	17.41
T5	246	242	16.08	15.94	53.12	50.61	47.15	47.65	21.81	20.66
T6	269	266	20.56	20.09	87.47	75.76	64.70	65.08	00.00	00.00
T7	225	220	11.03	10.92	-	-	-	-	46.35	45.63
SEm±	**0.019**	**0.024**	**0.244**	**0.212**	-	-	-	-	-	-
CD (P=0.05)	**N.S.**	**N.S.**	**0.760**	**0.662**	-	-	-	-	-	-

YI=2019 and YII=2020

due to better weed control. The use of FYM as a mulch materials significantly increased the yield (258, 255 and 257 g/plant) (18.30, 18.04 and 18.17 t/ha) (T_3), followed by dry leaves of *Schima wallichi* and *Eupatorium* (251, 249 and 250 g/plant) (17.05, 16.59 and 16.82 t/ha) (Table 1).

Hand weeding twice at 45 (89.16 and 84.26%) and 90 DAS (64.70 and 65.08%) (Table 1). The highest weed control efficiency was noted under treatment received FYM mulch @ 5.0 t/ha (68.09 and 62.99%) at 45 DAS and 90 DAS (60.80 and 60.61%) (T_3) and dry leaves of *Schima wallichi* and *Eupatorium* (56.79 and 54.03%) at 45 DAS and at 90 DAS (50.35 and 50.95%) (T_4) (Table 1). The highest weed index was noticed under control (46.35, 45.63 and 45.99) (without mulch and hand weeding) (T_7) (Table 1). This might be due to higher infestation of different species of weed in under unweeded control. However, lowest weed infestation under hand weeding twice (45 DAS and at 90 DAS).

There was highest number of weeds species in unweeded control (T_7). This might be due to higher infestation by broad leaved (*Bidens pilosa, Amaranthus species, Physalis minima, Sida acuta, Solanum nigrum, Polygonum, Rumex nepalensis, Ageratum conyzoides*), grasses (*Cynodon dactylon, Digitaria* spp., *Eleusina indica, Imperata cylindrica*) and sedges (*Cyprus* spp.).

Thus it may be concluded that manual weed control practices and soil surface cover with different mulch materials is significant to achieve a good control of weeds along with enhanced yield of ginger.

REFERENCES

Bu Y S, Shao H L and Wang J C. 2002. Effects of different mulch materials on corn seeding growth and soil nutrients' contents and distributions. *Journal of Soil and Water Conservations* **16**(3): 40–42.

Choudhary V K and Kumar P S. 2019. Weed prevalence, nutrient wash, water productivity and yield output of turmeric (*Curcuma longa* L.) under different land configuration and mulches. *Journal of Cleaner Production* **210**: 793–03.

Choudhary V K and Kumar P S. 2013.Crop and water productivity, profitability and energy consumption pattern of maize–based crop sequence in North Eastern Himalayan Region, India. *Archives of Agronomy and Soil Science* **59**(5): 653–69.

Ghosh P K, Devi Dayal, Bandyopadhyay K K and Mohanty M. 2006. Evaluation of straw and polythene mulch for enhancing productivity of irrigated summer groundnut. *Field Crops Research* **99**: 76–86.

Lalitha B S, Nagaraj K H and Anand T N. 2001. Effect of soil solarisation on weed dynamics and yield of groundnut–tomato sequence. *Mysore Journal of Agricultural Science* **35**(3): 226–31.

Sah D, Heisnam P, Mahato N K and Pandey A K. 2017. Weed management in ginger (*Zingiber officinale* Rose) through integrated approaches. *International Journal of Current Microbiology and Applied Science* **6**(1): 1839–45.

Current Horticulture 11(2): 67–70, May–August 2023 DOI: 10.48165/chr.2023.11.2.11

Standardization of dehydration techniques for vegetable cluster bean (*Cyamopsis tetragonoloba*)

PS Gurjar, A K Verma, Hanuman Ram*, R K Meena and D K Samadia

ICAR-Central Institute for Arid Horticulture, Beechhwal, Bikaner, Rajasthan, India

Received: 12 September 2021; **Accepted:** 4 October 2022

ABSTRACT

An experiment was conducted to standardized dehydration techniques for clusterbean (*Cyamopsis tetragonoloba* L.) pods at ICAR-CIAH, Bikaner, during 2020-21. The pods were blanched for different durations (3, 4, 5, 6 and 7 minutes) in boiling water to standardize blanching process. Five minutes blanching in boiling water followed by immediate dipping in cold water was found optimum for getting quality dehydrated product. Blanching treatment significantly enhanced the drying (5.67) and rehydration rate (4.65) and augmented rehydration capacity of dried pods. The dehydration recovery was 21.24% of fresh pods. The dried samples stored with HDPE pouches had low moisture content and high rehydration capacity than the samples stored with LDPE pouches. Thus, it is recommended that blanching is an essential process for quality pods. The HDPE pouches were found suitable packaging material for storage stability of dried pods.

Key Words: Dehydration, Blanching, LDPE, HDPE, Pods, Drying, Rehydration

Clusterbean (*Cyamopsis tetragonoloba* L.) is a rich source of soluble fiber content and minerals. Edible portion is a rich source od nutrition (Krishnakumar *et al*., 2016). The tender green pods which are used extensively for vegetable culinary both as green and dried pods (Samadia, 2012). Dried vegetables have great potential to use throughout the year (Samadia, 2016). Arid and semi arid region of India blessed with abundant and inexhaustible alternative energy source (Singh *et al*., 2019). However, quality of dehydrated vegetable like colour, texture and rehydration capacity are very much essential for commercialization of products. Blanching, chemical dipping and osmotic procedure are applied to fruits and vegetables. So far blanching treatment and dehydration procedure have not been standardized for clusterbean. Therefore, study was undertaken to standardize dehydration procedure, packaging and storage of dried clusterbean pods.

MATERIALS AND METHODS

Fresh green pods (10-12 days after setting) of clusterbean 'Thar Bhadavi' were harvested in morning hours from Vegetable Experimental Farm of ICAR-Central Institute for Arid Horticulture, Bikaner. Immediately after harvesting pods were brought to post-harvest laboratory, sorting, grading and washing were carried out and uniform-sized pods were utilized. Two experiments consisting of standardization of blanching treatment and storage and packaging of dried beans were done.

A known quantity (350 g) of green pods was taken in a muslin cloth and dipped in boiling (95 °C) water for 3, 4, 5, 6 and 7 minutes for blanching treatment. Thereafter pods were dipped immediately in cold water (26 °C) for 5 minutes to prevent overcooking. Then pods were removed from the cold water and kept for drying in perforated SS trays at room temperature. One lot of pods was dried without blanching and treated as the control.

The drying ratio was calculated by the following formula:

$$\text{Drying ratio} = \frac{\text{Weight of fresh material before drying}}{\text{Weight of dried material}}$$

Twelve beakers (six each for blanched and unbalanced samples) of each 500 ml capacity were taken and 300 ml of boiling water and 20 g of dried sample were poured into each beaker and kept for 60 minutes for rehydration. Weight of rehydrated

***Corresponding author :** hramdhanari@gmail.com