Knowledge Level of Ginger Growers on Improved Cultivation Practices of Ginger (*Zingiber Officinale L.*) in Tuensang District, Nagaland

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ABSTRACT

The present study was conducted in Tuensang district of Nagaland, situated in the eastern most part of Nagaland, India. Tuensang district has been endowed with fertile soil and favourable climatic conditions for ginger cultivation and most of the farmers are cultivating ginger on a large scale, thus, this study was conducted with an objective to examine the knowledge level of improved cultivation practices of Ginger by ginger growers. The study was carried out in four villages under one RD block with a sample size of 120 ginger growers as respondents. Ex-Post Facto research design was adopted for this study. Based on recommended practices of cultivation, it was concluded that majority of the respondents knowledge level was medium. Almost all (95-98%) of the respondents had knowledge on propagation; harvesting and post-harvest management. Half of the respondents had knowledge on improved varieties; physiological disorders; intercultural operations; disease and pest management. It was found that less than half of the respondents had knowledge on land preparation; climate and soil requirement while, knowledge on spacing, planting time, water requirement and manure were negligible. However, it was inferred that the local practices of planting time, spacing and manuring with wood ash as followed by the respondents were found to be more effective in their local situation, therefore, the indigenous knowledge may be documented and promoted wherever applicable.

1. Introduction

Ginger (*Zingiber officinale* L.) which belongs to the family Zingiberaceae is an herbaceous perennial crop, the underground modified stem or rhizomes are used as a spice. In India, ginger is cultivated in almost all the states. "Ginger is cultivated in most of the states in India, however, States namely Karnataka, Orissa, Assam, Meghalaya, Arunachal Pradesh and Gujarat together contribute 65 percent to the country's total production" (Sanjay, 2015) . "The total ginger production in India was at 21.20 lakh ton in 2021-22. In the same year, the country exported 1.48 lakh ton ginger worth Rs 837.34 crore" (Arjun, 2022).

Ginger is cultivated in *jhum* lands, terraced lands, *Zabo* lands, buns, as well as in plains. Farmers rely on organic inputs, local resources and practices for traditional methods of cultivation. The Northeast region is rich in ginger diversity. "A large number of local cultivars like Bola ada, Moran ada, Jatia ada, Keki, Bazar local, Naga shing, Thingpuri, Shing Bhoi, Shing Bhukir, Khasi local, Tura, Thinglaidum, Thingpuidum, Thingria, Jugijan, Vichii, Nagaland local, Bhaise, Gorubathane, Jorethange, Nangrey, Majhauley, etc. are still grown in North Eastern Region" (Rahman et al, 2019). "About 3 lakhs tonnes of ginger are being produced annually from 47,641 ha land and the Northeast region is emerging as India's organic ginger hub" (Rahman et al, 2019). "In Nagaland, the area under ginger cultivation has increased terrifically from 2000 hectare in 2010-2011 to more than 4000 hectares in 2016-2017 with total production of 4862 metric tons" (Anonymous, 2017).

Tuensang district has been endowed with fertile soil and favourable climatic conditions for ginger cultivation. Most of the farmers living in Tuensang were cultivating

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ginger as a major source of income whereby 75 % of the farmers reported that, they were getting an income ranging from Rs.55000 to Rs.75000 annually and as reported by Kanjilal *et al.* (1997), the yield and quality of ginger grown in Tuensang, Wokha, Mon and Mokokchung districts were superior to the ginger from other districts of Nagaland. The traditional methods of cultivation are still practiced by the tribal farmers on large scale. In the study area, Nadia variety is the most acknowledged cultivated variety since it possessed low fibre and had maximum demand for culinary purposes, the same was also reported by Khrishnamurthy *et al.* (2008). The local intermediate sized varieties are mostly grown in bigger area in the study region even though Nadia is common amongst the farmers on productivity viewpoint. "In the year 2015 the new ginger variety *Hedychium chingmeianum* was discovered from Tuensang district of Nagaland" (Singh, 2019). In 2017, the Eleutheros Christian Society (ECS), a popular NGO in Tuensang district, had sold 730 tons of ginger produced of through e-auction within two days at a transactional value of over Rs. 40 lakhs which is expected to cross the figure when more are sold.

Thus, owing to the potentiality of high productivity in Tuensang district due to its favourable soil and climatic conditions, a study was undertaken to assess the knowledge level of ginger growers on improved cultivation practices of Ginger.

2. Methodology

The study was conducted in Tuensang district of Nagaland, situated in the eastern most part of Nagaland. It has a sub-tropical type of climate in the low land areas whereas elevated areas have temperate climate. This research was carried out in Four villages (Sangsangyu, Hakchang, Maksha and Kejok) under Sangsangyu RD blocks of Tuensang district, Nagaland, India. The respondents were selected based on proportionate random sampling to constitute a sample size of 120. Ex-Post Facto research design was adopted for this study. The improved techniques of ginger cultivation as recommended by Directorate of Horticulture, Government of Nagaland was considered and administered to the respondents.

To study the knowledge level of the respondents a list of knowledge items were prepared by referring to the package of practices for ginger recommended by the District Horticulture office, Tuensang, Nagaland, covering thirty one aspects. The practices were framed in question to acquire the response from the respondents. The answers were quantified by giving score '1' if they were having knowledge and '0' if they were not having knowledge about the practices.

The following method was adopted to develop knowledge index for measuring the knowledge of the respondents:

Knowledge index *(KI)* =

$$\frac{Total\ score\ obtained\ by\ the\ respondents}{Maximum\ possible\ score} \times 100$$

Based on the extent of knowledge possessed, the respondents were classified into three categories as – low knowledge level, medium knowledge level and high knowledge.

3. Results and Discussion

Knowledge level of respondents based on improved cultivation practices of ginger

Table 1. Knowledge level of the respondents regarding the recommended varieties, land preparation, climate and soil

N=120

Sl. No	Knowledge dimension		Frequency	Knowledge percentage (%)
1.	Varieties: a) Nadia:		120	50
	b) Varada:		3	
2	Land preparation: a) Ploughing		116	32.08
	b) Incorporation of FYM		10	
	c) Cultivated both rainfed		0	
	d) On hilly slopes along contour		29	
3	Climate: Ginger grows well in warm and humid climate. Temperature 25°-30° C.		49	40.83
4	Soil: A rich soil with good drainage. It grows well in sandy/red loam, and lateritic soil.		58	48.30

The table 1 reveals that overall 50 per cent of the respondents had knowledge about the improved varieties because they were aware that good yield of the crop mainly depends on selection of varieties, as similarly reported by Sundresha *et al* (2020). The table further shows that 32.08 per cent of the respondent had knowledge about the land preparation; about 40.83 per cent of the respondents had knowledge about the climate followed by soil with 48.3 per cent.

Ginger cultivation followed by the respondent in the selected block is usually done in *jhum* or shifting cultivation similar to the findings by Rahman *et al.* (2009). Before planting ginger, unwanted plants or bush were slashed by hand and left on the soil as mulch or burnt *in situ*. The land was then hand hoed often 2-3 times. A modified system of raised bed, called bun system, was adopted by the farmers. It involves slash and burn type and putting of dried of fresh weeds, bushes and crop residues in the form of raised bed (1 m width, 4-5 m length and 20-25 cm thick) along the slopes covering the buns with 3-5 cm soil. The gap between one *bun* to another is generally kept at 1 m. These practices which the farmers followed were quite similar to that of the recommended practice.

Table 2 shows that overall 96.67 per cent of the respondents had knowledge about the propagation method of ginger. Table further shows that 0.83 per cent had knowledge on recommended planting time; 2.50 per cent of the respondents were aware about the recommended spacing for ginger cultivation and only 16. 67 per cent of the respondents were aware about the exact seed rate for ginger cultivation.

As per the study it was found that, ginger was usually propagated by rhizomes called the seed rhizomes. The rhizomes were cut into small pieces weighing 10-15 cm and 50-60 g each having one or two excellent buds. Ginger was planted in the month of February to March on the onset of monsoon. For spacing, the recommended distance between the rhizomes is 30 cm but the farmer kept a distance of 20-25 cm and rhizomes were planted in the depth of 7-10 cm. Spade (*naga kur*) was used for making furrows at a distance of 2-3 ft.

Healthy rhizomes collected from organically cultivated farms or seeds materials having high yielding varieties were used when there was no purely produced material. The seed rhizomes were kept in the sun for a period of 20-30 days before planting. Majority of the respondents had undergone training given by District Horticulture Office personnel and had learnt the use of Trichoderma which was mixed in water and the ginger was soaked for an hour before planting in the field.

Table 2. Knowledge level of the respondents based on recommended propagation method, Planting time, spacing and seed rate

N=120

Sl. No	Knowledge dimension	Frequency	Knowledge percentage (%)
1.	Propagation method a) Propagated through rhizome	116	96.67
	b) 2.5-5 cm L,20-25 g	0	
2.	Planting time	2	0.83
3.	Spacing	3	2.50
4.	Seed Rate	20	16.67

Table 3. Knowledge level of the respondents based on Manuring and fertilization, Irrigation and Intercultural operation

N=120

Sl. No	Knowledge dimension	Frequency	Knowledge percentage (%)
1.	Irrigation	19	3.96
2.	Manuring	0	0
3.	Intercultural operation a) Mulching	2	53.16
	b) Weeding	106	
	c) Earthing up	88	

Table 3 revealed that (53.16%) of the respondents had knowledge level about the Intercultural operations like mulching, weeding and earthing up. Only about 3.96 per cent of the respondents had knowledge about the irrigation and water requirements for ginger as recommended by District Horticulture Office. None of the farmers had knowledge about the use of manures for ginger.

Table 4 revealed that 95.83 per cent of the respondents had knowledge for harvesting as recommended and about 50.83 per cent of the respondents had knowledge about the physiological disorder and pest of their crop field. None of the respondent had knowledge about the average yield as recommended by District Horticulture Office.

From the study, the Post-Harvest Management of Ginger were recorded as follows. It was found that, the maturity of the variety depended on the duration of crop which was about 8-10 months. The leaves turned yellow when they were fully matured and dried up gradually. Clumps were lifted cautiously with a spade or digging fork and rhizomes were separated from dried leaves, roots and adhering soil. The rhizomes were dried in the sun and the harvested ginger was usually cleaned by hand. After removing the soil particles and the mother rhizomes

separated, the harvested ginger was then kept for drying. The harvested ginger was kept in the sun for drying for few hours to a day. For drying the duration varied from availability of sunlight usually for 2-3 hours or for a day. The cleaned and dried ginger was then preserved in gunny bags or in bamboo baskets for transportation as well as for storage. The rhizomes to be used as seed material were preserved carefully by sun drying for 2-3 hours and then they were shifted to thatched huts for protection from rainfall and extreme heat.

With regard to Pest and Disease management, some of the major physiological disorder observed in the ginger were rhizome rot/ soft rot, bacterial wilt, leaf spot, sheath blight/leaf blight and to control these problems the farmers planted seed rhizome free from disease; burning of diseased plants; removal of the affected clumps along with the soil and use of Trichoderma as recommended during their training, to prevent rhizome rot.

Shoot borer, rhizome fly, white grub; leaf roller were some of the pest observed in the ginger fields and for management, the farmers mechanically collected and destroyed the caterpillars, grubs; removing the affected plant along with the soil and spreading of wood ashes on the plant as organic fertilizer to improve soil nutrition.

Table 4. Knowledge level based on Yield, Harvesting and disease and pest

N=120

Sl. No	Knowledge dimension	Frequency	Knowledge percentage (%)
1.	Yield	0	0
2.	Harvesting	115	95.83
3.	Disease and pest a) Rhizome rot/soft rot	78	50.83
	b) Shoot borer	78	
	c) Leaf roller	48	
	d) Bacterial wilt	44	

Table 5. Distribution of the respondents based on Overall Knowledge Level   N=120

Sl. No	Knowledge Level	Frequency	Percentage (%)
1.	Low(<6.68)	13	10.83
2.	Medium(6.68-11.68)	91	75.83
3.	High(>11.68)	16	13.33
	Total	120	100.00

Mean=9.18, SD=2.15

To measure the knowledge level of the respondents, knowledge index was developed. The category was made as low, medium and high based on the mean and standard deviation. Table 5 reveals that 75.83 percent of the respondents had medium knowledge level, followed by 13.33 per cent having high knowledge level and only 10.83 percent had low level. Thus it can be concluded that the knowledge level of the respondents was medium about the different aspects of recommended ginger cultivation practices in the study area. The finding was similar to the findings of Kumar and Sisodia (2006).

4. Conclusion

From the study it was concluded that, Ginger was cultivated in *jhum* or shifting cultivation. A modified system of raised bed, called bun system, was adopted by the farmers. The space between one *bun* to another is generally kept at 1 m. The recommended spacing between the rhizomes was 30 cm but the farmer kept a distance of 20-25 cm and rhizomes were planted in the depth of 7-10 cm which gave them a better yield. The major physiological disorder observed by the ginger were rhizome rot/ soft rot, bacterial wilt, leaf spot, sheath blight/leaf blight. Shoot borer, rhizome fly, white grub; leaf roller is some of the pest observed in the ginger fields.

Based on recommended practices of cultivation, it was concluded that majority of the respondents had medium knowledge level. Almost all (95-98%) of the respondents had knowledge on propagation; harvesting and post-harvest management. Half of the respondents had knowledge on improved varieties; physiological disorders; intercultural operations; disease and pest management. It was found that less than half of the respondents had knowledge on land preparation; climate and soil requirement while, knowledge on spacing, planting time, water requirement and manuring were negligible, however, it was inferred that the local practices of planting time, spacing and manuring with wood ash as followed by the respondents were found to be more effective in their local situation, therefore, the indigenous knowledge may be documented and promoted wherever applicable.

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