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# Effect of Weight of Planting Material on Growth and Yield of Ginger (*Zingiber officinale* Rosc.) in the Hilly Region of Darjeeling District

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**Abstract**

A field trial was conducted for two consecutive years to study the effect of weight of planting material in relation to growth and yield of ginger (*Zingibar officinale* Rosc.). Ginger cv Gorubathan was planted in ten different size, viz. 10 to 100 g with a increase at of 10 g. The spacing of 25 cm row to row and 20 cm plant to plant were maintained in both the years. The results revealed that rhizome pieces weighing 40 g each were found to be optimum for planting, which resulted in increase in plant height (74.58 cm), number of pseudostem per clump (4.73), number of leaves (54.79 per clump) and yield (49.08 tonnes per ha) compared to smaller rhizomes weighing 10, 20 or 30 g. Although an increase in the weight of planting materials upto 100 g increase the yield about 2.88 tonnes per hectare, further increase was however found to be uneconomical due to higher cost of the planting materials. Although 50 to 100 g showed maximum growth and yield but due to higher cost of planting materials it is uneconomical. Rhizome size 40 g each is best for planting material in the hilly region of Darjeeling District.

**Key words : Weight of planting material, Growth, Yield, Ginger.**

Ginger (*Zingiber officinale* Rosc.) is the dried underground modification of stem is a annual species crops belongs to family Zingiberaceae. It is a native of South-Eastern Asia. It is cultivated in almost all the tropical and sub-tropical parts of India specially in Kerala, and it plays an important role in the national economy. There are immense possibilities of increasing the production and productivity of ginger through the improvement of the crop. Since only vegetative propagation is practiced in this crop, it is always propagated by portions of the rhizomes known as seed pieces or setts. Usually about 30—100 g setts having atleast 2—3 good bud are used for planting. From the findings of several workers on ginger reported that size of rhizome has a considerable influence on the growth and yield of ginger. Groszman (1) recommended the use of portions of rhizome weighing 1 to 2 ounces and each as planting material for increased yields. Khan and Natesan (2) recorded the higher yields and profits from the plots where the large seed pieces were used (1,350 lbs per acre). Meenakshi (3) suggested that weighing $^1/_2$ ounce each with two sprouts should be planted 23 cm apart either way in order to get higher yields. Randhawa et al. (4) observed that largest sized rhizome as seeds (150 g each) significantly enhanced the yield as compared to smaller ones (60 g each). Among the four different seed sizes, i.e., 10—14; 15—19, 20—24 and 25—29 g tested in three different methods viz., raised beds, flat beds and trenches, it revealed that planting of 20—24 g, seed pieces (24 q/ha) in raised beds gave maximum yield of 10.583 kg per 7/5 sq.m. bed during 1979-80 (5). In a trail with two local cultivars of ginger i.e. pale yellow and red type, three sizes of rhizome 5 cm (20.1 g), 7 cm (20.2 g) and 9 cm (44.3 g) were studied. The pale yellow cultivars generally was better than the red cultivar with regard to sprouting percentage, sprouting rate, number of shoots produced and mean yield (6). The growers in this area have the idea that planting of bigger size of rhizome will yield more but the same is not true for all the cases. Different sizes of rhizome are being used by the ginger growers. With a view to find out the optimum size of rhizome, the present investigation was undertaken to increase the yield of rhizome and to reduce the cost of production.

## Methods

The experiment was laid out for two consecutive

**Table 1.** Effect of different size of planting materials on the plant height, number of pseudostem per clump, number of leaves per clump, plant yield in (kg) and total yield (tones/ha).

| Size of rhizome (g) | Plant height (cm) | | | Number of pseudostem per clump | | | Number of leaves per clump | | | Plant yield (kg) | | Total yield (t/ha) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st year | 2nd year | Pooled | 1st year | 2nd year | Pooled | 1st year | 2nd year | Pooled | 1st year | 2nd year | 1st year | 2nd year | 1st year | 2nd year |
| 10 | 59.36 | 58.00 | 58.68 | 3.83 | 3.51 | 3.67 | 45.43 | 46.24 | 45.83 | 0.146 | 0.154 | 0.146 | 0.154 | 0.146 | 0.154 |
| 20 | 66.67 | 66.42 | 66.54 | 4.03 | 4.25 | 4.14 | 48.93 | 56.66 | 52.79 | 0.183 | 0.198 | 0.183 | 0.198 | 0.183 | 0.198 |
| 30 | 69.31 | 71.42 | 70.36 | 4.19 | 4.50 | 4.34 | 48.78 | 56.52 | 52.65 | 0.221 | 0.209 | 0.221 | 0.209 | 0.221 | 0.209 |
| 40 | 75.92 | 73.25 | 74.58 | 4.53 | 4.94 | 4.73 | 54.33 | 55.26 | 54.79 | 0.251 | 0.240 | 0.251 | 0.240 | 0.251 | 0.240 |
| 50 | 78.46 | 76.33 | 77.39 | 4.42 | 4.90 | 4.66 | 54.77 | 60.46 | 57.61 | 0.251 | 0.251 | 0.251 | 0.251 | 0.251 | 0.251 |
| 60 | 79.98 | 78.08 | 79.03 | 4.26 | 4.32 | 4.29 | 54.76 | 61.02 | 57.89 | 0.253 | 0.252 | 0.253 | 0.252 | 0.253 | 0.252 |
| 70 | 81.63 | 81.63 | 81.63 | 4.20 | 4.20 | 4.20 | 53.90 | 63.10 | 58.50 | 0.254 | 0.253 | 0.254 | 0.253 | 0.254 | 0.253 |
| 80 | 85.36 | 85.54 | 85.45 | 3.57 | 3.88 | 3.72 | 52.34 | 60.54 | 56.44 | 0.255 | 0.256 | 0.255 | 0.256 | 0.255 | 0.256 |
| 90 | 80.84 | 83.46 | 82.15 | 4.14 | 3.52 | 3.83 | 56.83 | 58.36 | 57.59 | 0.259 | 0.258 | 0.259 | 0.258 | 0.259 | 0.258 |
| 100 | 83.80 | 80.18 | 81.99 | 3.00 | 3.40 | 3.20 | 47.12 | 56.40 | 51.76 | 0.259 | 0.260 | 0.259 | 0.260 | 0.259 | 0.260 |
| SE ± | 1.959 | 1.838 | 0.665 | 0.268 | 0.273 | 0.109 | 3.807 | 2.175 | 0.851 | 0.014 | 0.010 | 0.014 | 0.010 | 0.014 | 0.010 |
| CD at 5% | 5.429 | 5.093 | 1.975 | 0.742 | 0.756 | 0.323 | NS | 6.027 | 2.528 | 0.038 | 0.027 | 0.038 | 0.027 | 0.038 | 0.027 |

years at the Horticultural Research Station, Bidhan Chandra Krishi Viswavidyalaya, Krishi Kshetra, Pedong in the Darjeeling district, West Bengal 26.05$^0$N, 88.26$^0$E and 1066 m above mean sea level. The experiment was laid out in a randomized block design with three replication to find out the optimum size of rhizome for reducing the cost of production and maximization of ginger production in this area. The crop was planted in March and harvested in November when the plants are turned yellow. The soil type was sandy loam with a soil pH ranging from 5.65 to 5.80, organic carbon 1.45%, total nitrogen 0.158%, available phosphorus (kg/ha) 11.50 and available potash (kg/ha) 75.00. The winter was strong and prolonged beginning from November and continued till February. Coldest month was January with average minimum temperature 8.2 C. Hottest month was May with average maximum temperature 27.80 C. The annual rainfall during the first and second year were 1,064.48 and 1.022.40 respectively. Major part of the rain was received during June to August; cv Gorubathan was used as a planting materials in this study. The experiment was laid out with ten sizes of rhizome (viz. 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100 g) as planting material. The crop was fertilized at the rate of 60 kg nitrogen, 40 kg $P_2O_5$ and 60 kg $K_2O$ per hectare, nitrogen fertilizer was given in two equal splits i.e. one at the time of planting and the latter at 90 days after planting. Other fertilizers were applied at the time of planting. During land preparation well rottened FYM at the rate of 25 tonnes per hectare was applied as basal dose in all the plots. The experimental plots were raised bed of a size 2m × 1 m each. Immediately after planting the beds were covered with dry leaves at the rate of 5 tonnes per hectare once in a year. Mother rhizome were removed from the plants at 90 days after planting. Other cultural practices were followed based on common package of practices schedule for ginger cultivation. The crop is grown as a rainfed crop. The data obtained were analyzed by the analysis and variance method at 0.05 level.

## Results and Discussion

### *Plant Height (cm)*

Table 1 reveals that the maximum plant height (85.36, 85.54 and 85.45 cm) was recorded when the 80 g planting materials used in first and second year and pooled analysis of two years data and it was statistically at par with when 60, 70, 90 and 100 planting material used during first year, 70 and 90 g planting material in second year. In pooled analysis of two years data, it was statistically superior to all other planting materials. The minimum plant height (59.36, 58.00 and 58.68 cm) were recorded when 10 g planting materials used and it is inferior to all other planting materials first and second year and pooled analysis of two years data.

*Number of Pseudostem per Clump*

Maximum number of pseudostem was recorded (4.53, 4.94 and 4.73) during first year, second year and pooled analysis of two years data in 40 g planting meterial and it was statistically at par when 10, 20, 30, 50, 60, 70 and 90 g planting materials were used in first year, 20, 30, 50, 60 and 70 g were used as a planting material in second year and 30 and 50 g planting material were used in pooled analysis of two years data. Minimum number of pseudostem per clump were produced viz., 3.00, 3.40 and 3.20 respectively when 100 g planting material was used and it was statistically at par when the planting material used as 80 g in first year, 10, 80 and 90 g planting materials were used in second year and in pooled analysis of two years data, it was statistically inferior to all other treatments (Table 1).

*Number of Leaves per Clump*

Table 1 shows that in the first year the maximum number of leaves was recorded (56.83) when 90 g planting material were used and the minimum (45.43) leaves was recorded when 10 g planting material were used but statistically it was not significant at 5% level of significance.

In the second year and pooled analysis of two years data (Table 1) revealed that the maximum (63.10 and 58.50) number of leaves was recorded when 70 g planting material were used and it was statistically at par when 50, 60, 80 and 90 g planting materials were used in second year and in pooled analysis of two years data, it was statistically at par when 50, 60, 80 and 90 g planting material were used. The minimum (46.24 and 45.83) number of leaves was recorded when 10 g planting material were used and it was statistically inferior to all other planting material plantation in second year and in pooled analysis of two years data.

*Plant Yield (kg)*

Maximum plant yield (0.259 kg) was recorded when 90 and 100 g planting material were used (planted) and it was statistically at par with when 40, 50, 60, 70 and 80 g planting material were used. The minimum yield of plant (0.146 kg) were recorded when 10 g planting material used and it was statistically at par with when 20 g planting material were used (planted) in the first year (Table 1).

In the second year the maximum plant yield (0.260 kg) was recorded in 100 g plantation and it was statistically at par with when 40, 50, 60, 70, 80 and 90 g planting material were planted. The minimum (0.154 kg) plant yield were recorded when 10 g planting material were used and it was inferior to all other planting materials (Table 1).

In two years pooled analysis data revealed that the maximum plant yield (0.259 kg) were recorded when 100 g planting material were used and it was statistically at par with when 50, 60, 70, 80 and 90 g planting material were planted. The minimum plant yield (0.150 kg) were recorded when 10 g planting material were used and it was inferior to all other planting material when placed (Table 1).

*Total Yield (t/ha)*

The maximum total yield in first year was recorded (51.88 t/ha) when 90 and 100 g planting materials were used and it was at par with when 30, 40, 50, 60, 70 and 80 g planting material were used. The minimum (27.4 t/ha) total yield were recorded when 10 g planting material was used and it was inferior to all other planting materials when planted.

In the second year the maximum total yield (52.04 t/ha) was recorded when 100 g planting material were used and it was statistically at par with when 40, 50, 60, 70, 80 and 90 g planting material were used. The minimum (28.56 t/ha) total yield were recorded when 10 g planting material were used and it was inferior to all other planting material when planted (Table 1).

The pooled analysis of two years data revealed that the maximum total yield (51.96 t/ha) were recorded when 100 g planting material was planted and it was statistically at par with when 70, 80 and 90 g planting material when planted. The minimum total yield (27.98 t/ha) were recorded when 10 g planting materials were used and it is inferior to all other planting materials when planted (Table 1).

The results thus obtained revealed that different size of rhizome as planting material plays a significant role in increasing the yield and growth attributing character of ginger. Different researchers recorded that the size of rhizome as planting materials has a con-

siderable influence on the yield of ginger (7—17).

Thus it could be concluded that although 50 to 100 g of planting material showed maximum growth and yield but due to higher cost of planting materials it is uneconomical, so, rhizome size 40 g each is best for planting material in the hilly region of Darjeeling district.

**References**


1. Groszman. 1954. Ginger production. *Qd. Agric. J.* 78 : 259—262.
2. Khan K. F. and P. K. Natesan. 1955. A note on the influence of the size of seed rhizome on the yield in ginger (*Zingiber officinale* Rosc.). *South Ind. Hort.* 3 : 77.
3. Meenakshi S. 1959. Ginger earns good income for the West Coast. *Ind. Fmg.* 9 : 12—13.
4. Randhawa K. S., K. S. Nandpuri and M. S. Bajura. 1972. Studies on the comparative efficacy of different sizes of seed and spacings on the yield of ginger (*Zingiber officinale* Rosc.). *J. Res. India* 9 : 239—241.
5. Anonymous. 1981. *Progress report.* Cen. Plantation Crops Res. Inst., Kasaragod, Kerala, India.
6. Timpo G. M. 1982. Effects of cultivar and seed size on growth and yield of ginger (*Zingiber officinale* Rosc.). *Kumasitech J. Agric. Sci.* 1 : 14—21.
7. Mohanty D. C., Y. N. Sharma, B. S. Naik and B. S. Panda. 1988. Influence of fertilizer-cum-seed rates on yield and performance of selected ginger clones in the Eastern Ghats Highland zone of Orissa. *Ind. Cocoa, Arec. and Spices J.* 12 : 1—3.
8. Mohanty D. C., Y. N. Sarma, B. S. Panda and S. Edisan. 1993. Studies on fertilizer management and seed rates in ginger variety-Suruchi. *Ind. Cocoa, Arec. and Spices J.* 16 : 101—104.
9. Manzunathgoud B., J. Venkata Saha and K. H. Bhagavantagoundra. 2002. Studies on plant density and levels of NPK on growth, yield and quality of turmeric c.v. Bangalore local. *Mys. J. Agric. Sci.* 36 : 31—35.
10. Silva N. F. da, P. E. Sonnenberg and J. D. Borges. 2004. Growth and production of turmeric as a result of mineral fertilizer and planting density. *Horticul. Brasil.* 22 : 61—65.
11. Okwnowulu P. A. 1992. Influence of decreasing minimum sett weight and Intra-row spacing on the coated ginger cv Taffin-giwa. *J. Spices and Arom. Crops.* 1 : 59—64.
12. Ahmed N. U., M. M. Rahman, M. M. Hoque and A. K. M. Amzad Hossain. 1988. Effect of seed size and spacing on the yield of ginger. *Bangl. Hort.* 16 : 50—52.
13. Lee S. A. 1974. Effect of rhizome size and fungicide treatment on the sprouting and early growth of ginger. *Malay. Agric. J.* 49 : 480—491.
14. Patil R. B. and C. D. Borse. 1980. Effect of planting material and transplanting of seedlings of different age on the yield of turmeric (*Curcuma longa* L.). *Ind. Cocoa, Arec. and Spices J.* 4 : 3—5.
15. Rahaman A. and A. H. M. Faruque. 1974. A study on the effect of number of eyes of a seed, spacing and depth of planting on the yield of turmeric. *Bangla. Hort.* 2 : 25—27.
16. Anjaneyulu V. S. R. and D. Krishnamurthy. 1979. Spacing-cum-type of seed material trials on turmeric. *Ind. Cocoa, Arec. and Spices J.* 2 : 119—120.
17. Hussain C. A. and M. Said. 1965. Effect of size of seed on yield of turmeric (*Curcuma longa*). *W. Pak. J. Agric. Res.* 3 : 122—123.