

Original Research Article

Performance and Profitability Study of Different Ginger Based Cropping System in Bokaro District of Jharkhand

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ABSTRACT

A field experiment was carried out at farmers plot of ormo village of peterwar block of Bokaro district under krishi vigyan kendra Bokaro, Jharkhand in year 2013-2014 and 2014-2015 to overcome the problem of low system productivity in vegetable based cropping system under irrigated condition. The experiment consisted of 4 treatments, where one with sole ginger as mono crop and in the remaining spinach, cauliflower and bitter guard were included as intercrops with the ginger. The experiment was laid out in the randomized block design with four replications. Sole crop of ginger recorded the highest performance for all the growth characters, yield attributes and yield. Whereas the gross yield, net return and B: C ratio come into question, it showed T₄- Ginger + Spinach (Mixed cropping) + Cauliflower+ Bitter Guard perform best. So, from the overall point of view it may be concluded that intercropping in all the cases proved beneficial compared to that of mono culture.

Keywords

Ginger,
Intercropping,
Cauliflower,
spinach and bitter
guard

Introduction

In India major land is devoted for cereals and only 3% area of our total arable land is used for vegetable production. The per capita per day consumption of vegetable in India is on an average 125-130 g, but Indian Council of Medical Research recommended taking 285- 300 g of vegetable every day. To meet this requirement we have to produce 220 million tons of vegetable in 2020 AD from the present production level. In this direction, the only solution is to increase vegetable production and productivity per unit area per unit time through growing improved high yielding varieties, adequate and scientific crop

management practices and increasing cropping intensities following different cropping patterns.

Among the different cropping systems like multiple cropping, intercropping, relay cropping, succession cropping, intercropping is the most suitable practice to stabilize the production. According to Willey (1979), intercropping is the growing of two or more crops/varieties simultaneously on the same area of land. The crops may or may not be sown or harvested at the same time. Most important advantage of intercropping is that it is more

efficient and productive than sole cropping due to its higher combined yield. The risk due to weeds, disease, pests and climatic factors are reduced in the intercropping (Arnon, 1975).

The Kerala State is currently the leading producer ginger (70%) in India (NHB, 2014). Ginger is used as food, flavoring and medicinal products. Ginger is long duration crop.

Very short duration vegetables and other crops can be efficiently taken up in the field of ginger for better utilization of growth resources. In this regard on the basis of important considerations of intercropping some vegetable crops viz., spinach, cauliflower and bitter guard were selected as suitable intercrops to be grown with ginger.

The information for wider adaptability of the said intercrops with ginger towards improving vegetable production has not yet been exploited. In the light of the above, the objective of the study was to evaluate the performance of ginger based intercropping system with respect to crop growth, yield attributes and yield of ginger as well as economic feasibility due to sole crop and interactive effects of intercrops.

Materials and Methods

The experiment was conducted at Farmers plot of Ormo village of Peterwar block of Bokaro district under Krishi Vigyan Kendra Bokaro, Jharkhand in year 2013-2014 and 2014-2015. The research plot is situated at Latitude - 23°34.233 and Longitude - 86°01.592 with an average altitude of 200 m above mean sea level. The soil of the experimental field was laterite in nature with good drainage and water holding capacity and aeration. The soil was almost neutral in reaction with a pH of 5.8 and having 0.54%

organic carbon, 354.37 kg ha⁻¹ nitrogen, available phosphorous 19.27 kg ha⁻¹ and available potassium 175.84 kg ha⁻¹. The average temperature ranges from 25-36.5°C during summer and 12-25°C during winter months with average rainfall is about 1350 mm. This experiment is conducted in summer season and plot is having good irrigation facility.

The experiment was laid out in a Randomized Block Design with four treatments i.e. T₁ - Ginger grown as a sole crop T₂- Ginger + Spinach (Mixed cropping), T₃- Ginger + Spinach (Mixed cropping) + Cauliflower, T₄- Ginger + Spinach (Mixed cropping) + Cauliflower+ Bitter Guard. Each treatment was replicated four times.

Ginger rhizomes were sown in the field at a spacing of 48cm (R to R) and 10cm (Plant to Plant). Spinach is mixed during plot preparation. Normal cultural practices and plant protection measures were followed during the cultivation process.

For intercrops removing of spinach was carried out 35 days after sowing of seeds. Bitter guard is planted at spacing of 120 cm (R to R) x 60cm (Plant to Plant). Cauliflower if planted between row of ginger at a spacing of 48 cm (R to R) x 30cm (Plant to Plant) were maintained. No thinning operation was done in case of palak.

The data obtained for various characters were analyzed statistically following the methods of Gomez and Gomez (1984), Panse and Sukhantne (1989) and using online software OPSTAT. The Tables formulated by Fishers and Yates (1974) were consulted and for determination of critical difference (C.D.) at 5 % level of significance.

Results and Discussion

Phenological characters

The experimental results distinctly revealed that plant height, no of leaves per plant, leaf area and no of tillers of ginger was influenced to a considerable extent under intercropping with different crops (Table 1). The highest plant height (44.50 cm), no of leaves per plant (38.89), leaf area (38.37 cm²) and no of tillers per plant (6.31) of ginger had been recorded in T₄- Ginger + Spinach (Mixed cropping) + Cauliflower+ Bitter Guard based intercropping system.

The advantages of intercropping with ginger have also been demonstrated in numerous studies such as tomato or okra + cowpea (Olasantan, 1991), watermelon + soyabean (Sharaiha and Hattar, 1993) and cabbage + French bean (Poniedzialek and Kunicki, 1995). Significant differences were observed among the treatments of intercropping systems for plant height, no of leaves per plant, leaf area and no of tillers of the ginger (Table 1).

Growth characters

The experimental results distinctly revealed that ginger number of rhizome per plant is highest i.e. 4.66 is in T₁ (Ginger sole crop) and lowest 3.81 is in T₃ is shown in Table 2. The highest rhizome length 8.84 cm and rhizome width 6.56 cm had been recorded from sole Ginger crop (T₁). The highest no of rhizome per plant, rhizome length and rhizome width is found in sole crop of ginger might be due to the fact that it received full advantages of available resource to complete its vegetative growth (Yildirim and Guvenc, 2005). Significant differences were observed among the treatments of intercropping systems. The T₁ (sole Ginger) produced 189.13 qt/ha (Table

2) and it was the highest performer for this yield character followed by T₄. The value of T₁ differed significantly from all the other treatments.

However, a relatively higher ginger equivalent yield per hectare of 357.28 qt/ha had been obtained from T₄- Ginger + Spinach (Mixed cropping) + Cauliflower+ Bitter Guard based intercropping system, which were statistically *at par* from other treatments. The lowest ginger equivalent yield per hectare 189 qt/ha had been recorded from sole ginger crop.

Economics of intercropping system

The realization of production potential per unit area and time is dependent on investment. Market values play more important role rather than number of crops per unit area and time in determining economic returns. The present study had indicated that the most economically satisfactory intercropping system was T₄-Ginger + Spinach (Mixed cropping) + Cauliflower+ Bitter Guard with the net return of Rs. 498310.00 ha⁻¹ and benefit cost ratio of 3.30, the next best result was obtained under, T₃- Ginger + Spinach (Mixed cropping) + Cauliflower based intercropping system with net return and B:C ratio of Rs.424440.50 ha⁻¹ and 3.22 respectively (Table 3) as in these cases combined gross yield or bio mass production per unit area and unit time was much higher compared to that of other systems.

However, other intercrops namely, T₂-Ginger + Spinach (Mixed cropping) are not very close and not proved sufficiently lucrative compared to that of sole ginger cultivation. Similar findings were also reported by Jaswal *et al.*, (1993) Jayachandran *et al.*, (1992) and Thangaraj *et al.*, (1983).

Table.1 Morphological growth parameters of ginger crops in various cropping system in 2014 and 2015 (Pooled data)

Sl. No	Treatments	Plant height (cm)	No. of leaves per plant	Leaf area per plant (cm ²)	No. of tillers per plants
1	T ₁ - Ginger sole crop	41.43	31.23	37.88	4.33
2	T ₂ - Ginger + Spinach (Mixed cropping)	41.67	31.40	36.97	5.22
3	T ₃ - Ginger + Spinach (Mixed cropping) + Cauliflower	41.87	35.34	35.34	5.53
4	T ₄ - Ginger + Spinach (Mixed cropping) + Cauliflower+ Bitter Guard	44.50	38.89	38.37	6.31
C.D. at (5%)		00.96	01.20	00.76	00.87

Table.2 Yields and yield parameters of ginger rhizome in various cropping system in 2014 and 2015 (Pooled data)

Sl. No	Treatments	No of rhizome per plant	Rhizome length (cm)	Rhizome width (cm)	Fresh Ginger Rhizome Yield/ha (qt/ha)	Ginger Equivalent Yield (qt/ha)	Spinach Production (qt/ha)	Cauliflower Production (qt/ha)	Bitter Guard Production (qt/ha)
1	T ₁ - Ginger sole crop	4.66	8.84	6.56	189.13	189.00	-	-	-
2	T ₂ - Ginger + Spinach (Mixed cropping)	4.35	8.10	6.18	186.08	212.70	77.6	-	-
3	T ₃ - Ginger + Spinach (Mixed cropping) + Cauliflower	3.81	7.61	5.99	176.85	307.60	66.4	181.8	-
4	T ₄ - Ginger + Spinach (Mixed cropping) + Cauliflower+ Bitter Guard	4.43	8.12	6.41	187.05	357.28	69.1	178.2	79
C.D. at (5%)		0.33	0.37	0.26	5.11	3.12			

Table.3 Cost Benefit analysis in various cropping system in 2014 and 2015 (Pooled data)

Sl. No	Treatments	Cost of Cultivation (Rs)	Gross Return (Rs)	Net Return (Rs)	B:C Ratio
1	T ₁ - Ginger sole crop	152000	378000	226000	2.49
2	T ₂ - Ginger + Spinach (Mixed cropping)	163000	425400	262400	2.61
3	T ₃ - Ginger + Spinach (Mixed cropping) + Cauliflower	190760	615200	424440	3.22
4	T ₄ - Ginger + Spinach (Mixed cropping) + Cauliflower+ Bitter Guard	216250	714560	498310	3.30

Price: Ginger @Rs. 2000/q, Spinach @ Rs. 600/q, Cauliflower @ Rs. 1500/q, Bitter gourd @ Rs. 1000/q

In the present experiment, it had been realized that the growth characters, yield attributes and yield of ginger performed in comparatively better way when the main crop was intercropped with vegetables belong to cruciferae family (i.e. cauliflower).

However, when the gross yield, net return and B: C ratio come into question, it showed T₄- Ginger + Spinach (Mixed cropping) + Cauliflower+ Bitter Guard perform best. So, from the overall point of view it may be concluded that intercropping in all the cases proved beneficial compared to that of mono culture.

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