

## EFFECT OF INTERCROPPING COWPEA, FRENCH BEAN, TURMERIC AND GINGER WITH COLOCASIA UNDER AGRO-CLIMATIC CONDITIONS OF CHHATTISGARH PLAINS

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**Abstract:** The experiment was carried out in the field of AICRP on tuber crops, Research and Instructional Farm, Department of Horticulture, College of Agriculture (IGKV), Raipur (C.G.) during *Kharif*, 2010-11. The experiment was laid out in a randomized block design with nine treatments three replications with an objective to study the effect of intercropping cowpea, french bean, turmeric and ginger with colocasia under agro-climatic conditions of Chhattisgarh plains. The treatment consisted of sole and intercropping viz: T<sub>1</sub>- Colocasia (sole) with 60 x45 cm, T<sub>2</sub> - Colocasia + Cowpea (1:1) with 60 : 30 cm, T<sub>3</sub> - Colocasia + Cowpea (1:2) with 60 : (15 : 15) cm, T<sub>4</sub> - Colocasia + French bean (1:1) with 60 : 30 cm, T<sub>5</sub> - Colocasia + French bean (1:2) with 60 : (15 : 15) cm, T<sub>6</sub>- Colocasia + Turmeric (1:1) with 60 : 30 cm, T<sub>7</sub> - Colocasia + Turmeric (1:2) with 60 : (15 : 15) cm, T<sub>8</sub> - Colocasia + Ginger (1:1) with 60 : 30 cm, T<sub>9</sub> - Colocasia + Ginger (1:2) with 60 : (15 : 15) cm. The name of variety for different crops are Colocasia : Indira Arvi-1, Cowpea : Pusa komal, French bean : Contender, Turmeric : Rashmi, and Ginger: Suprabha. The result revealed that growth parameters of colocasia viz., plant height, number of leaves and yield attributes like number of cormels plant<sup>-1</sup>, weight of cormels plant<sup>-1</sup> weight of mother corm plant<sup>-1</sup>, total yield plant<sup>-1</sup>, total tuber yield and marketable tuber yield t ha<sup>-1</sup> were recorded significantly highest under sole cropping of colocasia. Among all intercropping system, plant height and number of cormels plant<sup>-1</sup> were observed higher under colocasia + cowpea at the 1:1 row ratio followed by colocasia + french bean at the 1:1 row ratio. Beside that; weight of cormels plant<sup>-1</sup>, weight of mother corm plant<sup>-1</sup>, total tuber yield and marketable tuber yield t ha<sup>-1</sup> were found higher under colocasia + ginger at the 1:1 row ratio among the other intercropping system.

**Keywords:** Intercropping, colocasia, cowpea, frenchbean, turmeric, ginger

### INTRODUCTION

Colocasia (*Colocasia esculenta* L.) Schott. var. *Cauntiquaram* is an herbaceous perennial plant belonging to the family Araceae is an important tuber crops of India as well as chhattisgarh. It is grown as a minor food crop as high as 2, 740 m (Bourke, 1982). The corms and cormels of colocasia are edible contains about 20 - 22 % of starch and significant amounts of calcium, phosphorous and vitamin C (Kay, 1973). The mature tuber of colocasia can be consumed in boiled, baked or roasted or fried, forms and leaves of colocasia are also eaten in different forms which contain about 23 % of protein on a dry weight basis. The tuber and leaves of this crop are an alternate source of dietary energy, especially for the tribal population. It is grown on hills and plains of Northern-Eastern India as rainfed crop where the rainfall is copious.

Its cultivation in Chhattisgarh is confined to an area of 7627.37 ha with a production 102808.95 metric tonnes (Anonymous, 2011). Looking to the increase in area of colocasia every year in this state, the research on cropping system is of prime importance. Substantial advantage in yield from intercropping compared with sole cropping occurred from complementary effect of different crop or varieties on each other, making better use of resources when grown together. Intercropping has been recognized as a beneficial system of crop production. The available literature suggested that intercropping could provide substantial yield advantages compared

to sole cropping without involving costly inputs simply by manipulation of growing crop together.

All these crops are important component of intercropping and by using these crops as an intercrop infestation of insect-pest and disease and also weed population can be minimized up to a greater extent. The main aim of intercropping is to reduce risk which is usually being faced by the farmers due to aberrant weather conditions especially under rainfed situation of different agro-climatic condition of Chhattisgarh. Therefore, there is urgent need to identify intercrops suitable for intercropping in colocasia. Hence the present investigation was conducted with the objective to study the effect of intercropping cowpea, french bean, turmeric and ginger with colocasia under agro-climatic conditions of Chhattisgarh plains.

### MATERIAL AND METHOD

The present investigation entitled "to study the effect of intercropping cowpea, french bean, turmeric and ginger with colocasia under agro-climatic conditions of Chhattisgarh plains." was carried out in the Experimental field of AICRP on Tuber crops, at Research and Instructional Farm, Department of Horticulture, College of Agriculture, IGKV, Raipur (Chhattisgarh) during the *Kharif*, 2010-11. The experiment was laid out in randomized block design with three replication. The experiment consisted of 9 treatments of sole and intercropping viz: T<sub>1</sub>- Colocasia (sole) with 60 x45 cm, T<sub>2</sub> - Colocasia + Cowpea (1:1)

with 60 : 30 cm, T<sub>3</sub> - Colocasia + Cowpea (1:2) with 60 : (15 : 15) cm, T<sub>4</sub> - Colocasia + French bean (1:1) with 60 : 30 cm, T<sub>5</sub> - Colocasia + French bean (1:2) with 60 : (15 : 15) cm, T<sub>6</sub> - Colocasia + Turmeric (1:1) with 60 : 30 cm, T<sub>7</sub> - Colocasia + Turmeric (1:2) with 60 : (15 : 15) cm, T<sub>8</sub> - Colocasia + Ginger (1:1) with 60 : 30 cm, T<sub>9</sub> - Colocasia + Ginger (1:2) with 60 : (15 : 15) cm. The name of variety for different crops are Colocasia : Indira Arvi-1, Cowpea : Pusa komal, French bean : Contender, Turmeric : Rashmi, Ginger : Suprabha.

The ploughing was done with tractor drawn cultivator followed by cross harrowing to pulverize the soil and mixed FYM at the rate of 10 t ha<sup>-1</sup>. Finally, the field was levelled with planker. Seeds were treated with Bavistin at the rate of 1 g kg<sup>-1</sup> of seeds and planting materials @ 2 gm SAAF per liter of water at the time of planting / sowing. The crops are sown upto 10 cm raised bed on July 8, 2010 by drilling the tubers manually. Crops were raised with their recommended package of practices. The recommended dose of fertilizer also applied for the intercrops along with sole crops colocasia. Fluchlorolin at the rate of 1.0 kg ha<sup>-1</sup> was sprayed at the time of last ploughing and well mixed in soil before sowing. Later on, hand weeding operation was carried out manually at 45 and 75 DAP. Colocasia was taken as main crop and other crops were taken as intercrops. Further, irrigations were given as and when required. Plant protection measures were adopted as and when needed during the crop (sole crops and intercrops) growth period.

## RESULT AND DISCUSSION

Data recorded on the effect of different intercrops on plant height at 150 DAP, no. of leaves plant<sup>-1</sup> at 150 DAP, no. of cormels plant<sup>-1</sup>, weight of mother corms/plant(g), weight of cormels/plant(g), total yield/plant(g), total tuber yield (t ha<sup>-1</sup>) and marketable tuber yield (t ha<sup>-1</sup>) are depicted in Table 1.

**Plant height (cm):** The data pertaining to plant height as depicted in Table 1 suggest that the significant differences in plant height were noted due to different intercropping treatments. At 150 DAP, significantly highest plant height was recorded from the sole cropping of colocasia (72 cm) which was statistically at par with colocasia + cowpea (67.46 cm), colocasia + french bean (67.40 cm) and colocasia + turmeric (64.33 cm) at the 1:1 row ratio. Whereas, minimum plant height (56.66 cm) was recorded under intercropping of (47.2 cm) colocasia + ginger at the 1:2 row ratio.

**Number of leaves plant<sup>-1</sup>:** A large variation was observed in number of leaves plant<sup>-1</sup> due to different treatments under study, which ranged from 4.10 to 6. The data clearly evidenced that sole crop of colocasia resulted significantly highest number of leaves plant<sup>-1</sup> (6.00) as compared to rest of the treatments at 150 DAP followed by intercropping with colocasia + french bean (5.53), colocasia + cowpea (5.46) at 1:1

row ratio and colocasia + french bean (5.30), colocasia + cowpea (5.20) at 1:2 row ratio, which were statistically at par with each other. Whereas, the lowest number of leaves plant<sup>-1</sup> (4.10) was observed under intercropping of colocasia + ginger at 1:2 row ratio.

Among the different treatments, sole cropping of colocasia recorded higher plant height (72 cm) and number of leaves plant<sup>-1</sup> (6.00) at 150 DAP. Osundare (2003) also reported the similar trend for stem height and number of leaves when cassava intercropped with other crops. Increase in plant height and number of leaves also helped in increasing the tuber yield plant<sup>-1</sup> which resulted in higher tuber yield ha<sup>-1</sup>. This was attributed mainly due to higher photosynthetic efficiency and net assimilation which contributed in increasing the overall growth of plants.

Many scientists from almost every corner of country suggested that the sole crop recorded highest growth parameters due to less competition for available resources than the crop grown under intercropping system. However, among intercropping system, the different growth parameters of colocasia were higher when intercropped with either french bean or cowpea in 1:1 row ratio than turmeric or ginger. Further, it was evident from the data that, 1:1 row ratio gave better growth behavior of colocasia plant than 1:2 row combination which might be due to more congenial atmosphere and nutrient provided due to more space available for all the crops.

**Number of cormels plant<sup>-1</sup>:** The data on number of cormels plant<sup>-1</sup> of colocasia are presented in Table 4.3. The data reveals that significantly highest number of cormels plant<sup>-1</sup> of colocasia (8.60) was observed in sole colocasia. However, among the intercropping, the number of cormels plant<sup>-1</sup> of colocasia was recorded the highest in the colocasia + cowpea (7.13) in 1:1 row ratio intercropping followed by colocasia + french bean (6.93) and colocasia + turmeric (6.93) in 1:1 row ratio. Whereas, the lowest number of cormels plant<sup>-1</sup> of colocasia (6.33) was recorded in colocasia + ginger in 1:2 row ratio intercropping.

**Weight of mother corm plant<sup>-1</sup>:** The data on weight of mother corm plant<sup>-1</sup> of colocasia under different treatments are presented in Table 1. The data indicates that weight of mother corm plant<sup>-1</sup> of colocasia was significantly highest in sole crop of colocasia (140.33 g). Among the intercropping system, weight of mother corm plant<sup>-1</sup> of colocasia was significantly highest under intercropping of colocasia + ginger (136.66 g) at 1:1 row ratio followed by colocasia + ginger (132.33 g) at 1:2 row ratio. Whereas, the lowest weight of mother corm plant<sup>-1</sup> (79.00 g) was recorded under intercropping of colocasia + cowpea at 1:2 row ratio.

**Weight of cormels plant<sup>-1</sup> (g):** The data on weight of cormels plant<sup>-1</sup> of colocasia under different treatments are presented in Table 1. The data indicates that the weight of cormels plant<sup>-1</sup> of colocasia was

significantly highest in sole crop of colocasia (430 g) followed by intercropping of colocasia + ginger (390 g) and colocasia + ginger (372 g) at 1:1 and 1:2 row ratios, respectively. The lowest weight of cormels plant<sup>-1</sup> of colocasia (298 g) was recorded under intercropping of colocasia + french bean at 1:2 row ratio.

**Total yield plant<sup>-1</sup> (g):** The data on total tuber yield plant<sup>-1</sup> of colocasia under different treatments are presented in Table 1. The data indicates that the total yield plant<sup>-1</sup> of colocasia was significantly highest in sole crop of colocasia (570.33 g) followed by intercropping of colocasia + ginger (526.66 g) and colocasia + ginger (504.33 g) at 1:1 and 1:2 row ratios, respectively. The lowest total yield plant<sup>-1</sup> of colocasia was recorded under intercropping colocasia + cowpea (377 g) at 1:2 row ratio.

**Total tuber yield (t ha<sup>-1</sup>):** The findings revealed that the total tuber yield of colocasia was significantly highest in sole crop of colocasia (20.60 t ha<sup>-1</sup>) which was statistically similar to intercropping of colocasia + ginger (18.95 t ha<sup>-1</sup>) at 1:1 row ratio. The lowest total tuber yield (14.15 t ha<sup>-1</sup>) of colocasia was

recorded under intercropping of colocasia + cowpea at 1:2 row ratio.

**Marketable tuber yield (t ha<sup>-1</sup>):** The data indicates that marketable tuber yield of colocasia was significantly highest in sole crop of colocasia (18.11 t ha<sup>-1</sup>). Among the intercropping treatment, marketable tuber yield of colocasia was significantly highest under intercropping of colocasia + ginger (17.42 t ha<sup>-1</sup>) followed by colocasia + ginger (16.50 t ha<sup>-1</sup>) at 1:2 row ratio, which were statistically at par with each other. Whereas, the lowest marketable tuber yield of colocasia (12.40 t ha<sup>-1</sup>) was recorded under intercropping of colocasia + cowpea at 1:1 row ratio. Yield attributes namely fresh total tuber yield (20.60 t ha<sup>-1</sup>) and marketable yield (18.11 t ha<sup>-1</sup>) of colocasia were recorded highest under sole crop than intercropping. Reduction in all the parameters under intercropping treatments may be due to higher competition for agro resources. Chattopadhyay *et al.* (2008) also found that different intercrops reduced the main crop (Elephant foot yam) yield significantly as compared to sole crop.

**Table 1:** Effect of sole and intercrop on growth and yield parameters of colocasia

Treatments	Plant height (cm) at 150 DAP	No. of colocasia leaves plant <sup>-1</sup> at 150 DAP	No. of cormels plant <sup>-1</sup>	Weight of mother corm plant <sup>-1</sup> (g)	Weight of cormels plant <sup>-1</sup> (g)	Total yield plant <sup>-1</sup> (g)	Total tuber yield (t ha <sup>-1</sup> )	Marketable tuber yield (t ha <sup>-1</sup> )
Sole Colocasia	72.00	6.00	8.60	140.33	430.00	570.33	20.60	18.11
Colocasia + Cowpea (1 : 1)	67.46	5.46	7.13	130.66	369.66	500.32	17.53	16.30
Colocasia + Cowpea (1 : 2)	61.46	5.20	6.33	79.00	298.00	377.00	14.15	12.40
Colocasia + French bean (1 : 1)	67.40	5.53	6.93	123.66	330.33	453.99	16.19	14.94
Colocasia + French bean (1 : 2)	63.00	5.30	6.60	121.00	322.00	443.00	16.00	14.16
Colocasia + Turmeric (1 : 1)	64.33	4.70	6.93	102.00	329.00	431.00	16.09	13.80
Colocasia + Turmeric (1 : 2)	60.40	4.25	6.46	85.33	322.66	407.99	15.84	13.81
Colocasia + Ginger (1 : 1)	63.06	4.65	6.80	136.66	390.00	526.66	18.95	17.42
Colocasia + Ginger (1 : 2)	56.66	4.10	6.33	132.33	372.00	504.33	18.14	16.50
SEM ±	2.51	0.35	0.39	8.55	17.36	18.15	0.63	0.98
CD (P = 0.05)	7.92	1.09	1.24	26.94	54.69	57.20	1.99	2.19

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