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Evaluation of Baby corn - Vegetable intercrop model for growth and yield attributes

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ABSTRACT: The present investigation entitled Evaluation of Baby corn - Vegetable intercrop model for growth and yield attributes was conducted during Rabi, 2022-23 at the College Instructional Farm, Rampur Nawagon, RABL College of Agriculture and Research Station Chhuikhadan, Dist- Khairagarh-Chhuikhadan-Gandai, (C.G.). The experiment is made up of 9 treatments in random block design (RBD) with three replications of the varied intercrops. The observations were recorded from germination percentage, plant height (cm), number of leaves per plant, stem base diameter (mm), earliness (day), root length (cm), root diameter (mm), number of cob/pod per plant, cob/pod girth (cm), cob/pod length (cm), cob/pod weight (gm), fresh weight of plant (gm), dry weight of plant (gm), cob/pod yield (kg /plot), cob/pod yield (kg/ha), green fodder yield (t /ha), harvest index (%) and benefit-cost ratio.

Among all treatment combinations (T_6) baby corn + cowpea (2:2), gives the maximum germination percentage (92.25), maximum plant height (175.15 cm), maximum number of leaves per plant (10.13), maximum stem base diameter (69.71mm), lowest number of days to 50% silking (51.45), lowest days to harvest (56.4), maximum root length (26.28cm), maximum root diameter (12.30mm), highest number of cob/pod per plant (2.90), highest cob/pod girth (3.08cm), highest cob/pod length (13.17cm), highest cob/pod weight (60.22gm), highest fresh weight of plant (295.12gm), highest dry weight of plant (75.25gm), highest cob/pod yield (8.73 kg /plot), highest cob/pod yield (7274.97 kg/ha), highest green fodder yield (14.75 t /ha), highest harvest index (33.01 %) and highest B:C ratio of (2.22). which was significantly superior to sole baby corn (1.39), whereas the lowest benefit cost ratio in (T_7) Baby corn + Okra (2:2) (0.52). On the basis of present investigation treatment (T_6) baby corn + cowpea (2:2), was found significantly superior for the growth and yield parameters in Chhattisgarh plains.

Keywords: Baby corn, Intercrops, B:C ratio.

INTRODUCTION

Baby corn (*Zea mays* L.) is the widely grown and staple food crop in many developing countries. After rice and wheat, it is the third-most significant grain, adding over 9% to India's food basket and 5% to the global supply of nutritional energy. It is referred to as a miracle crop and the queen of cereals because of its enormous output potential. Despite fetching a very lucrative price in domestic and international markets, Indian farmers are mostly unaware of its significance as a vegetable crop. The production of baby corn is dominated by Thailand and China worldwide. Some Indian states are now practising the production of baby corn (Ramachandrappa *et al*., 2004).

Baby corn is the dehusked corn ear, harvested within 2-3 days of silk emergence but prior to fertilization (Pandey *et al*., 2000). It is medium-sized plant that produces green ears 65 to 75 days after planting. It is sweet, succulent and delectable. Baby corn is thought to be an appropriate option for raising farmers' incomes.

Due to its short length, it makes it easier to plant a second crop concurrently as an intercrop.

Baby corn is typically planted in broader rows, where much of the incident solar energy falls on bare ground during the early stages of growth. Improved use of the land and sunlight is achieved by intercropping with medium-duration companion crops (Willey, 1979). In order for the unfertilized ovaries of baby corn, or the cobs, to be edible, they must be harvested before pollination and fertilization. Increasing the standard of living for people. Growing baby corn for use as vegetables is an exciting recent breakthrough in crop diversification and value addition, which is supported by the food processing sector. Individuals and a switch from a non-vegetarian to a vegetarian diet are credited for the popularity of baby maize cultivation (Rathika *et al*., 2013).

Other advantages of intercropping include the control of weeds, the increase of soil fertility, and the prevention of pests and illnesses (Sanginga and Woomer 2009; Seran and Brintha 2010). Systems for intercropping are adaptable and can be used to increase profit and reduce risk (Matusso *et al*., 2014). Compared to monocrops, it increases crop output and makes better use of resources like water, fertilizers and solar energy (Odedina *et al*., 2014).

The majority of intercropping systems are best suited for vegetable crops. Typically planted as an intercrop in most regions are legume vegetables like cowpea and Dolichos bean. Green, leafy vegetables like coriander are typically grown as a hedge against harm. Iodine-rich, full of vitamins and minerals, and useful as an intercrop, okra is a good source of all three (Odedina *et al*., 2014). These all vegetables are short duration crop which can be used for intercropping with baby corn.

Baby corn. Vegetable intercropping is a new cropping system in Rainfed Upland situation (Badi). Maize is profitable and liking crop of farmers and grown as sole crop in the villages. Due to nutrient exhaustive nature of maize crop, growing of baby corn (main crop) with cowpea, okra, coriander and Dolichos bean (as inter crops) in Badi (Kitchen Garden) in 2: 2 rows sequence will be beneficial. This system can maintain the soil fertility, working on IPM concept, prevent malnutrition and provide staggered income to the farmers.

MATERIAL AND METHOD

The field experiment was conducted during the Rabi season 2022-23 at the College Instructional Farm, Rampur Nawagaon, RABL College of Agriculture and Research Station Chhuikhadan, Dist-Khairagarh-Chhuikhadan-Gandai (C.G.). The investigation employed a Randomized Block Design (RBD). The treatment comprises of three replications of the varied intercrops, with a plot size of 4 × 3 meters square. There were 9 treatments, T_1 Sole Baby corn, T2 Sole Cowpea, T3 Sole Okra, T4 Sole Dolichos bean, T5 Sole Coriander, T6 Baby corn + Cowpea (2:2), T7 Baby corn + Okra (2:2), T8 Baby corn + Dolichos bean (2:2) and T9 Baby corn + Coriander (2:2).

RESULT AND DISCUSSION

Growth parameters. The experimental data presented in Table 1 revealed that the various growth parameters such as germination percentage, plant height (cm), number of leaves per plant, stem base diameter (mm), earliness, root length (cm), root diameter (mm). Among all treatment combinations baby corn + cowpea (2:2), gives the maximum germination percentage (92.25), maximum plant height (175.15 cm), maximum number of leaves per plant (10.13), maximum stem base diameter (69.71mm), lowest number of days to 50% silking (51.45), lowest days to harvest (56.4), maximum root length (26.28cm) and maximum root diameter (12.30mm) respectively, whereas the lowest germination percentage was observed in baby corn + okra (2:2) (79.16). However remaining observations, minimum data was obtained from sole baby corn. Also, sole baby corn spent the highest number of days for 50% silking (54.27) and highest number of days (59.5) to harvest.

The genetic makeup, physical characteristics, and environmental variables of the seed impact its germination percentage. Different environmental conditions, including temperature, precipitation, light, air, moisture content, and humidity, affected the germination performance (Lopes *et al*., 1996). The intercropping of legumes has a considerable impact on baby corn plant height. Baby corn and vegetable cowpea intercropping considerably raised the base crop's height. This may be the outcome of reduced or absent crop-weed competition and improvements in the majority of crop growth metrics in favorable environmental conditions, which promote improved plant growth. Similar outcomes in maize and legume intercropping were previously reported by Bali ready *et al*. (2009). This could be as a result of the extra nitrogen supplied by nitrogen-fixing bacteria, which seemed to have raised the number of leaves stated by Reddy *et al*. (2009). When it came to crop geometry, a wider spacing of 60 × 20 cm was associated with a much higher stem girth, while a narrower spacing of 30 × 20 cm was associated with a significantly lower girth. The reasons for improved plant girth with wider row spacing could be attributed to greater nutrition and increased sun radiation availability. Similar findings were also reported by Mohan *et al*. (2018). Nitrogen levels in also significantly affected the number of days for harvesting. The treatment which received higher nitrogen then other treatment because of legume intercrop took significantly delayed the silking and less number of days to harvest. The delayed harvest in plots receiving lower dose of nitrogen might be due to low availability of nitrogen to plants. Similar results were also reported by Wasnik *et al*. (2012); More *et al*. (2013). Increased production of amino acids and chlorophyll Increased biochemical activity leading to

higher photosynthate translocation from leaves to roots and the production of chlorophyll and amino acids may cause an increase in root length and root girth. Similar results were also reported by Patil and Gill (1981); Sunanda *et al*. (2006).

Yield parameters. The experimental data presented in Table 2 revealed that the various yield parameters such as number of cob/pod per plant, cob/pod girth (cm), cob/pod length (cm), cob/pod weight (gm), fresh weight of plant (gm), dry weight of plant (gm), cob/pod yield (kg /plot), cob/pod yield (kg/ha), green fodder yield (t /ha) and harvest index (%). Among all treatment combinations baby corn + cowpea (2:2), gives the highest number of cob/pod per plant (2.90), highest cob/pod girth (3.08cm), highest cob/pod length (13.17cm), highest cob/pod weight (60.22gm), highest fresh weight of plant (295.12gm), highest dry weight of plant (75.25gm), highest cob/pod yield (8.73 kg /plot), highest cob/pod yield (7274.97 kg/ha), highest green fodder yield (14.75 t /ha) and highest harvest index (33.01 %) respectively, whereas the lowest number of cob/pod per plant (1.76), minimum cob/pod girth (1.55cm), lowest cob/pod length (9.29cm), lowest cob/pod weight (44.79gm), lowest fresh weight of plant (175.05gm) and lowest dry weight of plant (38.39gm) was recorded in Sole baby corn (2:2). However, the minimum cob/pod yield (3.66 kg /plot), cob/pod yield (3049 kg/ha), green fodder yield (8.79 t /ha) and harvest index (25.69 %) was noted in Baby corn + Okra (2:2).

Corn is planted in intercropping due to less competition for space and nutrients and/or more efficient utilization of natural resources. Taller plants, a higher number of leaves per plant and higher leaf-to-stem ratio in paired rows of legume intercropping further support the high number of cobs, higher cob girth and higher baby corn yield in paired rows over intercropping treatments. Similar reports of better performance of corn in paired rows over intercropping was also reported by Kumar and Prasad (2003); Kumar and Venkateswarlu (2013). This made baby corn under intercropped situation to grow taller, and to accumulate more dry matter, taller plants with higher dry matter accumulation offered better translocation of the stored food from source to sink which might have resulted in more ear length and increased ear weight. Similar results were also reported Amini *et al.* (2013). Corn crops can access additional nitrogen through legume intercropping (Mohapatra and Pradhan 1992). Because of the higher crop canopy, crop leftovers, and decreased evapotranspiration, the corn + legume intercropping system allowed for the maximum amount of water content in the soil (Balyan, 1997). Due to these reasons, the plant grew more as compared to other treatments. Got more fresh weight and higher yield attributes. Intercropping makes optimal use of soil water, nutrients, and light when corn is seeded. As a result, the plant developed growth faster and started accumulating more dry matter. Legume nutrient spurge may account for the intercropping's overall increase in green fodder yield.

Economics

Benefit – Cost ratio. Data pertaining to gross returns, net returns and benefit cost ratio are presented in Table 3. The highest gross returns (Rs. 344000 ha^{-1}), net returns (Rs. 237198 ha^{-1}) and benefit cost ratio (2.22) was recorded in baby corn + cowpea intercropping. which was significantly superior to T1 sole baby corn (1.39) whereas the lowest benefit cost ratio in (T7) Baby corn + Okra (2:2) (0.52). The increased benefit cost ratio might be due to increased yield obtained from baby corn and also additional income obtained from intercrops. These findings were in close conformity with those of Rathika *et al*. (2014).

Table 1: Growth parameters of baby corn based intercropping systems.

Treatment	Germination percentage		Plant height (cm)		Number of leaves plant^{-1}		Stem base diameter (mm)		Root length (cm)		Root diameter (mm)	
	Base crop	Intercrop	Base crop	Intercrop	Base crop	Intercrop	Base crop	Intercrop	Base crop	Intercrop	Base crop	Intercrop
T1- Sole baby corn	90.19 (9.54)											
T2- Sole Cowpea	83.03 (9.16)	-										
T3- Sole Okra	72.24 (8.54)	-	148.17	-	7.17	-	60.42	-	21.54	-	9.52	-
T4- Sole Dolichos bean	87.51 (9.40)	-	36.41	-	47.75	-	16.20	-	27.92	-	6.13	-
T5- Sole Coriander	81.51 (9.08)	-	40.42	-	7.67	-	22.30	-	21.89	-	3.47	-
T6- Baby corn + Cowpea (2:2)	92.25 (9.65)	84.14 (9.20)	39.10	-	35.13	-	18.82	-	27.88	-	7.84	-
T7- Baby corn + Okra (2:2)	79.16 (8.95)	73.40 (8.60)	14.79	-	23.82	-	6.30	-	6.91	-	4.13	-
T8- Baby corn + Dolichos bean (2:2)	81.22 (9.06)	84.38 (9.22)	175.15	38.31	10.13	50.44	69.71	16.81	26.28	30.22	12.30	8.11
T9- Baby corn + Coriander (2:2)	82.32 (9.12)	82.82 (9.14)	160.37	40.05	7.84	6.95	63.02	23.26	23.85	22.45	10.23	4.91
			170.65	41.94	8.62	36.61	65.06	17.54	24.17	29.68	10.87	9.37
			158.66	16.83	7.83	26.63	62.59	7.82	23.29	8.26	10.36	5.72
SEm+	3.61 (0.20)		4.35		0.76		3.27		1.63		0.53	
CD at 5%	10.93 (0.60)		13.17		2.31		9.90		4.95		1.62	
CV%	7.51 (3.79)		9.19		7.65		13.28		12.52		11.16	

Note: - Figures in parentheses indicate square root transformed values of percentages.

Table 2: Yield parameters of baby corn based intercropping systems.

Treatment	No. of Cob/Pod per plant		Cob/Pod girth (cm)		Cob/Pod length (cm)		Cob/Pod weight (gm)		Fresh weight of plant (gm)		Dry weight of plant (gm)		Cob/Pod yield (kg/ha)	
	Base crop	Intercrop	Base crop	Intercrop	Base crop	Intercrop	Base crop	Intercrop	Base crop	Intercrop	Base crop	Intercrop	Base crop	Intercrop
T1- Sole baby corn	1.76	-	10.42	-	9.29	-	44.79	-	175.05	-	38.39	-	4591.64	-
T2- Sole Cowpea	8.27	-	2.54	-	27.58	-	9.21	-	52.71	-	12.07	-	10149.95	-
T3- Sole Okra	9.67	-	5.30	-	10.30	-	12.41	-	45.11	-	11.04	-	6299.97	-
T4- Sole Dolichos bean	9.45	-	5.69	-	9.20	-	15.11	-	58.13	-	13.42	-	8324.96	-
T5- Sole Coriander	-	12.23	-	3.81	-	29.91	-	11.58	8.39	-	0.93	-	3016.65	-
T6- Baby corn + Cowpea (2:2)	2.90	11.63	14.89	6.92	13.17	11.51	60.22	14.36	295.12	72.87	75.25	18.13	7274.97	7074.97
T7- Baby corn + Okra (2:2)	1.99	13.37	11.21	6.86	10.31	10.10	46.02	10.30	194.87	65.00	42.31	15.34	3049.98	3891.65
T8- Baby corn + Dolichos bean (2:2)	2.28	-	12.38	-	11.63	-	57.30	-	210.31	74.05	52.43	15.90	4349.98	3441.65
T9- Baby corn + Coriander (2:2)	2.18		12.11		11.14		50.62		190.53	12.09	49.08	1.09	5516.64	1058.32
SEm+	0.42		0.26		0.88		2.86		8.12		2.05		204.72	
CD at 5%	1.31		2.50		2.70		8.77		24.57		6.21		619.05	
CV%	12.21		12.21		11.92		12.77		10.29		10.85		6.07	

Table 2a: Yield parameters of baby corn based intercropping systems.

Treatment	Green fodder yield (t/ha)		Harvest index (%)	
	Base crop	Intercrop	Base crop	Intercrop
T1- Sole baby corn	12.25	-	27.25	-
T2- Sole Cowpea	-	-	-	-
T3- Sole Okra	-	-	-	-
T4- Sole Dolichos bean	-	-	-	-
T5- Sole Coriander	-	-	-	-
T6- Baby corn + Cowpea (2:2)	14.75	-	33.01	-
T7- Baby corn + Okra (2:2)	8.79	-	25.69	-
T8- Baby corn + Dolichos bean (2:2)	9.41	-	31.56	-
T9- Baby corn + Coriander (2:2)	12.43	-	30.71	-
SEm+	0.84		1.52	
CD at 5%	2.79		5.05	
CV%	12.68		8.91	

Table 3: Gross return, Net return and Benefit – Cost ratio of baby corn based intercropping systems.

Treatment	Total Cost of cultivation (Rs. ha^{-1})	Gross returns (Rs. ha^{-1})	Net returns (Rs. ha^{-1})	Benefit – Cost ratio
T1- Sole baby corn	56901	136500	79599	1.39
T2- Sole Cowpea	49901	150000	100099	2.00
T3- Sole Okra	49901	120000	70099	1.40
T4- Sole Dolichos bean	50901	160000	109099	2.14
T5- Sole Coriander	45101	120000	74899	1.66
T6- Baby corn + Cowpea (2:2)	106802	344000	237198	2.22
T7- Baby corn + Okra (2:2)	106802	160500	53698	0.52
T8- Baby corn + Dolichos bean (2:2)	107802	178800	70998	0.65
T9- Baby corn + Coriander (2:2)	102002	189000	86998	0.85

CONCLUSIONS

The growth parameter was found significantly superior in treatment baby corn + cowpea (2:2), for the following variable *i.e.*, germination percentage, plant height (cm), number of leaves per plant, stem base diameter (mm), earliness, root length (cm), root diameter (mm). The yield parameter was found significantly superior in treatment baby corn + cowpea (2:2), for the following character *i.e.*, number of cob/pod per plant, cob/pod girth (cm), cob/pod length (cm), cob/pod weight (gm), fresh weight of plant (gm), dry weight of plant (gm), cob/pod yield (kg /plot), cob/pod yield (kg/ha), green fodder yield (t /ha) and harvest index (%). Also, the highest B:C ratio was observed in baby corn + cowpea (2:2).

REFERENCES

Amini, R., Shamayeli, M. & Nasab, A. D. M. (2013). Assessment of yield and yield components of corn (*Zea mays* L.) under two and three strip intercropping systems. *International Journal of Biosciences*, *3*(3), 65-69.

Balyan, J. S. (1997). Performance of maize (*Zea mays*) – based intercropping system and their after effect on wheat (*Triticum aestivum*). *Indian Journal of Agronomy*, *42*(1), 26-28.

Kumar, K. T. & Venkateswarulu, B. (2013). Baby corn (*Zea mays* L.) performance as vegetable-cum-fodder in intercropping with legume fodders under different planting patterns. *Range Management & Agroforestry*, *34*(1), 137-141.

Kumar, P. & Prasad, N. K. 2003. Biological and economical sustainability of forage maize (*Zea mays*) + cowpea (*Vigna ungiculata*) intercrop. *Indian Journal of Agricultural Sciences, 73*(6), 341-342.

Lopes, A. J., Stamford, N. P., Figueired, M. V. B., Burity, N. A. & Ferraz, E. B. (1996). Effect of vermicompost, mineral nitrogen and mineralizing agent on N fixation and yield in cowpea. *Revista Brasileira de Ciência to Solo*, *20*, 55-62.

Matusso, J. M. M., Mugwe, J. N. & Mucheru-Muna, M. (2014). Potential role of cereal-legume intercropping systems in integrated soil fertility management in smallholder farming systems of Sub-Saharan Africa. *Research Journal of Agriculture and Environmental Management*, *3*(3), 162-174.

Mohapatra, B. K. & Pradan, L. (1992). Intercropping fodder legumes with maize (*Zea mays* L.) in different planting patterns. *Annals of Agricultural Research*, *13*(4), 366-371.

Mohan, M., Rathore, A. L. & Jha, S. K. (2018). Response of drip fertigation, intra row seeding of legume and planting geometry on net return of summer maize. *International Journal of Pure and Applied Bioscience*, *6*(2), 964-967.

More, S., Deshmukh, S., Shinde, P. & Deshmukh, V. (2013). Effect of integrated nitrogen management with vermiwash in corn (*Zea mays* L.) on growth and yield. *African Journal of Agricultural Research*, *8*(38), 4761-4765.

Odedina, J. N., Fabunmi, T. O., Adigbo, S. O., Odedina, S. A. and Kolawole, R. O. (2014). Evaluation of cowpea varieties [*Vigna unguiculata* (L.) Walp] for intercropping with okra [*Abelmoschus esculenta* (L.) Moench]. *American Journal of Research Communication*, *2*(2), 92-97.

Pandey, A. K., Prakash, Ved, Mani, V. P. & Singh, R. D. (2000). Effect of rate of nitrogen and time of application on yield and economics of baby corn (*Zea mays* L.). *Indian Journal of Agronomy*, *45*(2), 338-343.

Patil, B. D. & Gill, A. S. (1981). Response of carrot to N P K fertilization. *Indian Journal of Agronomy*, *26*(2), 203-204.

Ramachandrappa, B. K., Nanjappa, H. V., Thimmegowda, M. N. & Soumya, T. M. (2004). Production management of profitable baby corn cultivation. *Indian Farming*, pp. 3-7.

Rathika, S., Velayudham, K., Thavaprakaash, N. & Ramesh, T. (2013). Weed smothering efficiency and productivity as influenced by crop geometry and intercropping in baby corn (*Zea mays* L.). *Journal of Progressive Agriculture*, *4*(1), 87-90.

Rathika, S., Velayudham, K., Thavaprakaash, N. & Ramesh, T. (2014). Biological efficiency of legume intercrops in baby corn (*Zea mays* L.). *International Journal of Agriculture, Environment and Biotechnology*, *7*(3), 627-633.

Reddy, V. B., Madhavi, G. B., Reddy, V. C., Reddy, K. G. & Reddy, M. C. S. (2009). Intercropping of baby corn (*Zea mays* L.) with legumes and cover crops. *Agricultural Science Digest*, *29*(4), 260-263.

Sanginga, N. & Woomer, P. L. (2009). Integrated soil fertility management in Africa: Principles, practices and development process. Tropical Soil Biology and Fertility Institute of the International Centre for Tropical Agriculture, Nairobi, Kenya.

Seran, T. H. & Brintha, I. (2010). Review on maize based intercropping. *Journal of Agronomy*, *9*(3), 135-145.

Sunanda, D. E. V. I., Karam, N. and Devi, H. N. (2006). Effect of Anti-Transpirant and Mulches on Growth and Yield of Soybean [*Glycine max* (L.) Merrill] under Manipur Conditions. Soybean Research, pp.188.

Wasnik, V. K., Reddy, A. P. K. & Kasbe, S. S. (2012). Performance of winter maize (*Zea mays* L.) under different rates of nitrogen and plant population in Southern Telangana region. *Crop Research*, *44*(3), 269-273.

Willey, R. W. (1979). Intercropping-Its Importance and research Needs. Part1. Competition and Yield Advantages. *Field Crop Abstracts*, *3*(2), 1-10.

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