Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(4): 1387-1389
Received: 16-05-2020
Accepted: 17-06-2020

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Effect of integrated nutrient management on yield parameters of babycorn

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DOI: https://doi.org/10.22271/phyto.2020.v9.i4s.11938

Abstract
A field experiment was conducted at Agricultural College and Research Institute, Killikulam during (September - November) 2019 to study the effect of different integrated nutrient management combination on the yield of babycorn. The experiment was laid out in randomized block design with three replications using baby corn G 5414 as test variety. Two different organic manures (farmyard manure and poultry manure) with inorganic nutrients were randomly allotted in the experiment along with one control plot for comparison, in order to find out the effect of different integrated nutrient management combination on the yield of baby corn. In general, yield components and yield were significantly influenced by the different combination of integrated nutrient management. All the parameters such as number of baby corn plant-1, cob length, cob girth, green cob yield and green fodder yield were studied. All the treatments significantly influenced the yield of babycorn over RDN and control. Among the different treatments, application of 75 % RDN through Poultry manure + 25 % RDN through chemical fertilizer (T_7) recorded higher green cob and green fodder yield.

Keywords: INM, FYM, poultry manure, babycorn, yield

Introduction
Babycorn is one of the dual-purpose crop and it has higher production potential due to its wider adaptability and fast growing nature. Sandy loam to loam soils with good organic matter is enough to hold moisture for optimum crop growth and development. Being a dual-purpose crop, the ears (cobs) are used (13 – 20 %) as human food and the remaining is used as fodder for ruminants because of its succulent palatable nature and excellent fodder quality Kumar *et al*. (2015) [6]. It can also be used as ingredients in industries for the production of food sweeteners, beverages and for fuel purpose. Asia ranks 1st in the consumption of Babycorn while worldwide, USA ranks 1st in production (2018-2019) (12.42 billion bushels), followed by China (10.91 billion bushels). In India, maize is cultivated in an area of 9.38 million hectares with a production and productivity of 28.75 million tons and 3065 kg ha^{-1} respectively. In Tamil Nadu maize is cultivated in 3.24 lakh hectares with an annual production of 2.59 million tons with a productivity of 7986 kg ha^{-1} (Indiastat, 2017) [4]. Babycorn being a C_4 plant has tremendous yield potential and responds well to applied inputs. However, its potential could not be exploited fully due to lack of proper management practices like nutrient management, season and variety (Singh *et al*., 2010) [9]. Babycorn is a nutrient exhaustive crop and due to high planting density, integrated nutrient management practices are important to get maximum benefit. Use of organics to augment chemical fertilizers is the need of the hour in many agricultural crops. To cope up with the situation, the use of organic and inorganic sources of nutrients was taken up to evaluate the varying levels of nutrients on the physio- chemical properties of soil and crop yield. Profitability of Baby corn cultivation has drastically declined owing to increased cost of cultivation and declining factor productivity of monetary inputs such as fertilizer and plant protection chemicals. There is scope for cost reduction in cultivation, if organics are used to replace fully or partially the chemical inputs. Nitrogen plays a significant role in plants. It is well known that baby corn is widely adaptable to the application of N. In plant metabolism, nitrogen plays a crucial role as it is an integral component of diverse forms of metabolically active compounds. As it is also a constituent of protoplasm, chlorophyll, nucleic acid, and amino acids, it is crucial for grain, vegetative production, and maize yield establishments. It imposes some lasting effects on cob size, cob weight, and finally in cob yield with all the plants. The adoption of INM practices on the field will reduce the production cost, thereby increasing the economic yield of the farmers and also increases the supply and availability of soil nutrients to the crop as well as increasing the activity of beneficial soil microorganism due to availability of more organic matter content and leads to sustain soil fertility and productivity.

Materials and methods

Site

The experiment was conducted at the Central Farm, Agricultural College and Research Institute, Killikulam, Thoothukudi District which is located in the Southern part of Tamil Nadu at 8°46' N latitude and 77°42' E longitude and an altitude of 40 m above mean sea level. This region falls under agro-climatic zone V (Southern zone) of Tamil Nadu.

Source of biological materials

A variety of Babycorn G-5414 was obtained from Bangalore. The crumbled farmyard manure was collected from the Department of Agronomy, Agriculture College and Research Institute, Killikulam. The well putrefied poultry manure was obtained from Nanalkaadu village, Tuticorin district.

Land preparation

The experimental field was ploughed by passing tractor mounted cultivator twice and the field was well prepared and made free from volunteer plants and provided drainage facility. Soil was exposed to sunlight and 3 to 4 rounds of harrowing was carried out to get fine tilth. And, then field was demarcated, for carrying out experiment as per the plan. After final harrowing, well decomposed FYM and poultry manure were applied as per the treatment combination. The individual plots were prepared as per the respective plot size. Finally ridges and furrows were made at 45 cm interval uniformly in all the plots.

Experimental design and data collection

The experiment was laid out in randomized block design with ten treatments replicated thrice using different integrated nutrient management combination as per the treatment schedule *viz*., 100 % RDN through chemical fertilizer (T_1), 100 % RDN through FYM (T_2), 75 % RDN through FYM + 25 % RDN through chemical fertilizer (T_3), 50 % RDN through FYM + 50 % RDN through chemical fertilizer (T_4), 25% RDN through FYM + 75 % RDN through chemical fertilizer (T_5), 100 % RDN through Poultry manure (T_6), 75 % RDN through Poultry manure + 25 % RDN through chemical fertilizer (T_7), 50 % RDN through Poultry manure + 50 % RDN through chemical fertilizer (T_8), 25 % RDN through Poultry manure + 75 % RDN through chemical fertilizer (T_9) and Absolute control (T_{10}). Data were recorded using a sample of five plants taken randomly from the outer two rows in each plot. The data were collected at the time of harvesting. And the data collected to study the yield components i.e., number of baby corn plant-1, cob length, cob girth, green cob yield and green fodder yield of babycorn were recorded.

Statistical analysis

The data were subjected to standard statistical analysis following the procedures described by the Gomez and Gomez (1984) [2]. Where significant treatment differences (F-test) were found, critical differences (CDs) were determined at a 5 per cent probability level and the values were reported. Treatment differences that were not significant were described as "NS."

Results and discussion

Yield attributes

Yield attributing characters, *viz*. number of baby corn plant^{-1}, cob length, cob girth, green cob yield and green fodder yield were significantly influenced by different integrated nutrient management combination (Table 1). Yield parameters of baby corn *viz*., number of baby corn per plant, cob weight, cob length and cob girth were deviated significantly due to different organic manure treatment. Similar result was observed by (Khaliq *et al*., 2004) [5]. The increased supply of nitrogen might have stimulated the rate of various physiological processes in plant and led to increased yield attributes and yield. Similar findings were also reported by Pal *et al*. (2017) [8].

Number of cobs

The number of cobs was significantly influenced by the INM practices. Application of 75 % RDN through Poultry manure + 25 % RDN through chemical fertilizer (T_7) recorded higher number of cobs as 2.67 cobs per plant. This treatment was on par with the application of 50 % RDN through Poultry manure + 50 % RDN through chemical fertilizer (T_8) and 25 % RDN through Poultry manure + 75 % RDN through chemical fertilizer (T_9), wherein the number of cobs were 2.53 and 2.47 respectively. Increase in number of cobs and cob yield could be attributed to favourable effect of higher levels of nutrient application on yield Sobhana *et al*. (2012) [10].

Cob length and Girth of cob

The cob length of babycorn was significantly influenced by the different integrated nutrient management practices. Among the treatments, application of 75 % RDN through Poultry manure + 25 % RDN through chemical fertilizer (T_7) registered higher cob length of 22.2 cm. The next best treatment was the application of 50 % RDN through Poultry manure + 50 % RDN through chemical fertilizer (T_8).

The girth of cob was influenced by the INM practices. Among the treatments, application of 75 % RDN through Poultry manure + 25 % RDN through chemical fertilizer (T_7) recorded the higher girth of 9.2 cm. It was on par with the application of 50 % RDN through Poultry manure + 50 % RDN through chemical fertilizer (T_8) with the value of 8.9 cm. As a result, the application of poultry manure was found to increase the cob length and girth and such results could be attributed to optimum availability of nutrients which might enhance the production and transfer of assimilates (Anees *et al*., 2016) [1].

Green cob yield

There were differences observed in Babycorn yield due to various INM practices. (Table 2). Application of 75 % RDN through Poultry manure + 25 % RDN through chemical fertilizer (T_7) registered the higher cob yield of 11360 kg ha^{-1}. This was statistically on par with the application of 50 % RDN through Poultry manure + 50 % RDN through chemical fertilizer (T_8), and its cob yield was registered as 10933 kg ha^{-1}. The treatment (T_8) was on par with the application of 25 % RDN through Poultry manure + 75 % RDN through chemical fertilizer (T_9). The Absolute control (T_{10}), registered lower cob yield of 7609 kg ha^{-1}. Finding of (Hekmat and Abraham, 2016) [3] revealed that the increase in yield and yield component of baby corn was due to the application of poultry manure. This is accordance with the findings of Okoroafor *et al*., (2013) [7].

Green fodder yield

INM treatments exerted significant influence on green fodder yield of babycorn during the year of experiment. (Table 2). Among the treatments, application of 75 % RDN through Poultry manure + 25 % RDN through chemical fertilizer (T_7) registered higher green fodder yield of 30551 kg ha^{-1}. The next best treatment was the application of 50 % RDN through Poultry manure + 50 % RDN through chemical fertilizer (T_8) with the green fodder yield of 27802 kg ha^{-1}. The Absolute

control (T_{10}) registered lower green fodder yield of 15706 kg ha^{-1}. Application of 50 % RDF through inorganics + 50 % RDF through poultry manure enhanced the stover yield due to adequate biomass production and better nutrient uptake which was similar to the finding of Yadav and Lourduraj, (2006) [11].

Conclusion

From this experiment, it can be concluded that the application of 75 % RDN through Poultry manure + 25 % RDN through chemical fertilizer was found to be superior with respect to yield attributes and cob and fodder yield.

Acknowledgements

Authors are highly thankful to the Tamilnadu Agriculture University, Agriculture College and Research Institute, Killikulam, Tamilnadu for providing all assistance and research material. We are also grateful to Dr. T.Rangaraj, Former Professor and Head, Department of Agronomy, Agriculture College and Research Institute, Killikulam, Tamilnadu and Dr. V.M. Sankaran, Professor and Head, Department of Agronomy, Agriculture College and Research Institute, Killikulam, Tamilnadu for their assistance during the study period.

Table 1: Effect of integrated nutrient management practices on yield attributes of Babycorn

	Treatments	No. of Cobs	Length of cob (cm)	Girth of cob (cm)
T_1	100 % RDN through chemical fertilizer	2.07	19.6	8.4
T_2	100 % RDN through FYM	1.80	18.7	7.3
T_3	75 % RDN through FYM + 25 % RDN through chemical fertilizer	2.33	20.7	8.8
T_4	50 % RDN through FYM + 50 % RDN through chemical fertilizer	2.33	20.5	8.7
T_5	25 % RDN through FYM + 75 % RDN through chemical fertilizer	2.20	20.1	8.4
T_6	100 % RDN through Poultry manure	1.87	19.2	8.0
T_7	75 % RDN through Poultry manure + 25 % RDN through chemical fertilizer	2.67	22.2	9.2
T_8	50 % RDN through Poultry manure + 50 % RDN through chemical fertilizer	2.53	21.0	8.9
T_9	25 % RDN through Poultry manure + 75 % RDN through chemical fertilizer	2.47	20.8	8.9
T_{10}	Absolute control	1.40	18.0	7.2
	SEd	0.09	0.14	0.11
	CD (P=0.05)	0.20	0.31	0.23

Table 2: Effect of integrated nutrient management practices on yield of Babycorn

	Treatments	Green cob yield (kg ha^{-1})	Green fodder yield (kg ha^{-1})
T_1	100 % RDN through chemical fertilizer	9384	21423
T_2	100 % RDN through FYM	8366	16143
T_3	75 % RDN through FYM + 25 % RDN through chemical fertilizer	10158	23417
T_4	50 % RDN through FYM + 50 % RDN through chemical fertilizer	9996	22683
T_5	25 % RDN through FYM + 75 % RDN through chemical fertilizer	9703	22474
T_6	100 % RDN through Poultry manure	9072	20563
T_7	75 % RDN through Poultry manure + 25 % RDN through chemical fertilizer	11360	30551
T_8	50 % RDN through Poultry manure + 50 % RDN through chemical fertilizer	10933	27802
T_9	25 % RDN through Poultry manure + 75 % RDN through chemical fertilizer	10440	24504
T_{10}	Absolute control	7609	15706
	SEd	295.12	806.85
	CD (P=0.05)	620.03	1695.16

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