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EFFECT OF NITROGEN AND PANCHAGAVYA ON GROWTH AND YIELD OF BABY CORN (*Zea mays* L.)

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ABSTRACT
The study was aimed to analyse the effect of nitrogen and panchagavya on growth and yield of Baby corn (*Zea mays* L.). Among the treatments 60 kg N + 4 sprays of 3% Panchagavya was superior than the rest and recorded the maximum plant height (117.67cm), dry matter accumulation (1466.52 g/m^2), leaf area index (8.00), crop growth rate (41.48 g/m^2/day), number of cobs per plant (2.14), number of cobs/ha (166296.3), yield with husk (261.39 q/ha),yield without husk (53.71q/ha) and greenfodder yield (37t/ha) in baby corn. The present investigation revealed that 60 kg N + 4 sprays of 3% Panchagavya would produce maximum growth and yield attributes and can be recommended for baby corn cultivation.

INTRODUCTION

Maize (*Zea mays* L.) is the world's third leading cereal crop following wheat and rice, and has the highest production potential among the cereals. In India, maize is grown in 9.22 M ha area with a production and productivity of 28.72 million tonnes and 3,115 kg/ha respectively contributing 2.53% share over world's production (Directorate of Economics and Statistics 2018, FAO Statistics 2020).Baby corn is a vegetable crop that can potentially improve the economic status of farmers (Das *et al*.,2008).Baby corn is the young, finger-length de-husked corn young ear of female inflorescence, harvested within 2-3 days of silk emergence but prior to fertilization and is crisp and sweet in taste. (Pandey *et al*., 2000). It is a profitable crop that allows a diversification of production, aggregation of value, and increased income (Pandey *et al*.,2002). It is highly remunerative and farmers can get a high return in a short period of 45-60 days.

As baby corn is a high demanding crop which provide more income within a shortperiod, farmers are cultivating those on large scale with huge input of inorganic fertilisers which in turn leads to land degredation.The main idea of this research is to supplement some source of organic formulations in replacement of inorganic fertilizer.

Nitrogen is most deficient primary nutrient in Indian soil and varies from state to state. Nitrogen is considered as one of the most important plant nutrients for growth and development of crop plant. It also plays an important role in synthesis of chlorophyll and amino acids that contribute to the building unit of protein and thus, growth of plants. Nitrogen helps in early establishment of leaf area capable of photosynthesis. Nitrogen promotes leaf and stem growth rapidly which consequently increase the yield and its quality.(Chouhan *et al*., 2016). Research substantiates that available nitrogen status increased with increased supply of nitrogen in the form of either fertilizers or organic manures which ultimately increased the productivity of maize. As far as grain yield in cereal is concerned the role of nitrogen is vital. It is therefore, necessary to identify the critical steps associated with nitrogen use efficiency. The nitrogen use efficiency is only about 30-40% in Indian soil.

In addition to nitrogen plants require so many vital elements. Panchagavya is one among the effective methods which can provides macro nutrients, essential micro nutrients, many vitamins, required amino acids, growth promoting substances and beneficial microorganisms for plants well growth. Panchagavya is known to contain bio-fertilizers such as Azospirillum, Azotobactor, Phosphobacteria and Psuedo-monas besides Lactobacillus (Yadav and Lourduraj, 2006). Foliar spray of panchagavya provides drought hardiness by acting as a thin oily layer on leaves and stems and thus reduce evaporational loss and also it can play a significant role in providing resistance to pests and diseases, resulting in overall yields (Tharmaraj *et al*., 2011).

Intensive agricultural practices have resulted in numerous problems like micro nutrient deficiencies, nutrients imbalances, and deterioration of soil health and decline crop yield. No single source of nutrient is capable of supplying plant nutrients in adequate amount and in balanced proportion. Not only this, but also fertilizers are more expensive in developing countries. Therefore, the current trend is to explore the possibility of supplementing chemical fertilizers

with organic and Biofertilizers.(Mishra *et al*., 2016).Hence the paper deals with the effect of nitrogen and panchagavya on growth and yield of baby corn with the aim to include environmentally safe technology for baby corn production.

MATERIALS AND METHODS

The experiment was conducted during the Zaid season 2019, at the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj (U.P.) This area is situated on the right side of the Yamuna river by the side of Prayagraj-Rewa road about 12 km from the city. Prayagraj has a subtropical and semi-arid climatic condition, south-eastern part of Uttar Pradesh prevails with both extremes of temperature, *i.e*. winter (3ºC) and summer(48ºC).The soils were characterized as sandy loam in texture with pH 7.1 analyzed using glass electrode pH meter, electrical conductivity 0.26 dS/m analyzed using conductivity meter (Jackson, 1973), organic carbon 0.36% Walkley and Black method (Nelson and Sommer, 1982), available N 171.48 kg/ha Alkaline potassium permanganate method for nitrogen (Subbiah and Assija, 1956), available P 15.20 kg/ha analyzed by Olsen's method (Nelson and Sommer, 1982), available K 232.50 kg/ha analyzed by Flame photometry (Jackson, 1973).

The experiment was laid out in Randomized Block Design. There were 13 treatments and each replicated thrice.T_1:80 kg N + 60 kg P + 40 kg K (control),T_2:40 kg N + 3 sprays of 3% panchagavya,T_3:40 kg N + 3 sprays of 4% panchagavya, T_4:40 kg N + 4 sprays of 3% panchagavya, T_5:40 kg N + 4 sprays of 4% panchagavya, T_6:60 kg N + 3 sprays of 3% panchagavya, T_7:60kg N + 3 sprays of 4% panchagavya, T_8:60 kg N + 4 sprays of 3% panchagavya, T_9:60 kg N + 4 sprays of 4% panchagavya, T_{10}:80 kg N + 3 sprays of 3% panchagavya, T_{11}:80 kg N + 3 sprays of 4% panchagavya, T_{12}:80 kg N + 4 sprays of 3% panchagavya, T_{13}:80 kg N + 4 sprays of 4% panchagavya. Every treatment contains blanket recommendation of phosphorous and potassium (60 and 40 kg/ha) respectively.

For growth attributes, the height of plant was measured from the base of the plant to the highest point of the uppermost leaf whose tip is pointing down, Number of green leaves/plant was counted,to calculate leaf area index leaves were collected from the plant and leaf area was measured with leaf area meter was divided by ground area and multiplied with number of leaves, crop growth rate represented as dry weight gained by a unit area of crop in a unit time expressed as g/m2/day.

For yield attributes number of cobs and weight of cobs per plant are counted, the cobs were harvested from net plot area as per treatment and weighed without husk and yield was converted into q/ha and from the net plot after harvesting of cobs left over green plants were cut from ground level which were weighed and mean value was recorded for green fodder estimation was converted to t/ha.

The raw data was subjected to appropriate statistical procedure as suggested by Gomez and Gomez (1984). The data from the experiments were analyzed statistically, wherever treatment differences were found significant, the critical differences were worked out at 5% level of probability (P = 0.05).

RESULTS AND DISCUSSION

Nitrogen and panchagavya levels showed substantial effect on different growth and yield attributes of baby corn. Data regarding growth parameters is presented in Table1. The highest plant height was observed with the application of 60 kg N + 4 spray of 3% Panchagavya (117.67cm) which was significantly superior over control (88.00cm), by 33.7 %. This increment indicates that plants used N during active cell division to form building blocks (protein) for cell elongation. Many research studies have showed that organic formulations release nutrients slowly and may reduce the leaching losses, particularly N (Nevens and Reheul, 2003 and Naveed *et al*., 2008).The highest number of leaves was observed with 60kg N + 3 sprays of 4% panchagavya (9.53) and there was no significant difference among treatments. Increasing nitrogen level did not significantly affect number of leaves per plant. This was probably attributable to the genetic factor which control number of leaves per plant.This was in accordance with the findings of Eltelib *et al*. (2006). The highest dry matter accumulation was observed in 60 kg N + 4 sprays of 3%

Table 1: Effect of different levels of Nitrogen and Panchagavya on Growth attributes of Babycorn.

Treatments	Plant height (cm)	Number of leaves (nos.)	Dry matter accumulation (g/m^2)	Leaf Area Index (LAI)	Crop Growth Rate (g/m^2/day)
80 kg N + 60 kg P + 40 kg K (control)	88	8.36	670.3	6.59	16.29
40 kg N + 3 sprays of 3% Panchagavya	89.67	8.93	640.68	6.08	17.41
40 kg N + 3 sprays of 4% Panchagavya	91.4	8.6	736.96	6.4	18.52
40 kg N + 4 sprays of 3% Panchagavya	99.87	9	651.79	5.17	16.29
40 kg N + 4 sprays of 4% Panchagavya	101.6	9.13	540.69	6.48	13.33
60 kg N + 3 sprays of 3% Panchagavya	103.73	8.6	592.53	4.99	15.55
60 kg N + 3 sprays of 4% Panchagavya	114.87	9.53	803.62	5.06	19.63
60 kg N + 4 sprays of 3% Panchagavya	117.67	9.27	1466.52	8	41.48
60 kg N + 4 sprays of 4% Panchagavya	82.6	8.8	959.16	5.05	24.07
80 kg N + 3 sprays of 3% Panchagavya	100.47	8.36	622.16	4.74	16.29
80 kg N + 3 sprays of 4% Panchagavya	92.07	9.6	888.8	5.28	23.33
80 kg N + 4 sprays of 3% Panchagavya	114.07	8.87	951.76	5.5	22.96
80 kg N + 4 sprays of 4% Panchagavya	107	9.27	744.37	5.85	21.48
SEm(±)	7.1	0.41	34.51	0.44	4.17
CD (P = 0.05)	20.73	NS	100.72	1.28	12.16

Table 2: Effect of different levels of Nitrogen and Panchagavya on Yield Attributes of Baby corn.

Treatments	No. of cobs Per Plant	No. of cobs Per ha	Yield with husk(q/ha)	Yield without husk(q/ha)	Fodder (t/ha)
80 kg N + 60 kg P + 40 kg K (control)	1.01	78518.5	170.65	30.67	20.67
40 kg N + 3 sprays of 3% Panchagavya	1.24	96296.3	215.08	45.88	19
40 kg N + 3 sprays of 4% Panchagavya	1.41	110000	218.9	47.28	27
40 kg N + 4 sprays of 3% Panchagavya	1.4	109259.3	221.46	47.87	25.33
40 kg N + 4 sprays of 4% Panchagavya	1.4	109259.3	216	46.66	21.33
60 kg N + 3 sprays of 3% Panchagavya	1.13	87777.8	191	42.23	21.67
60 kg N + 3 sprays of 4% Panchagavya	1.41	110000	227.24	49.11	33
60 kg N + 4 sprays of 3% Panchagavya	2.14	166296.3	261.39	53.71	37
60 kg N + 4 sprays of 4% Panchagavya	0.78	60370.4	177.62	39.58	22.67
80 kg N + 3 sprays of 3% Panchagavya	1.31	101851.9	209.91	45.4	27.33
80 kg N + 3 sprays of 4% Panchagavya	1.14	88888.9	193.08	43.12	22
80 kg N + 4 sprays of 3% Panchagavya	1.72	133703.7	221.03	49.22	30.67
80 kg N + 4 sprays of 4% Panchagavya	1.61	125555.6	233.81	50.76	25.67
SEm(±)	0.09	7008.8	9.99	2.49	1.29
CD (P = 0.05)	0.26	20457.25	29.17	7.28	3.78

Panchagavya (1466.52 g/m^2) which was significantly superior over rest of the treatments. The probable reason for maximum dry matter might be due to the supply of all micro and macronutrients and growth enzymes present in the panchagavya which favoured rapid cell division and multiplication. . With respect to Panchagavya, ammonia and nitrite oxidizers were found to colonize the leaves and increased the uptake and total N (Papen *et al*., 2002) and the presence of indole acetic acid (IAA) stimulated the growth of adventitious roots.

The highest leaf area index (LAI) was observed in 60 kg N + 4 sprays of 3% Panchagavya (8.00) which was significantly higher than rest of the treatments. This might be due to the fact that LAI is related to the supply and availability of N to plants which is supplied by the source of foliar applied Panchagavya.Organic manure supply essential nutrient elements to promote vigorous growth and physiological activities in the plant system(Kumar *et al*., 2018). In the present study CGR was significantly higher for 60 kg N + 4 sprays of 3% Panchagavya. The possible reason might be due to the fact that leaves are the main factors of photosynthesis and dry matter accumulation is expected that the treatment with optimum LAI will have more CGR. Panchagavya increased synthesis of growth promoting substances which is turn helped in increased growth .Similarly findings have been reported by Swaminathan *et al*. (2007) and Choudhary *et al*. (2014)

Yield parameters presented in Table 2 *viz*. the highest number of cobs/plant (2.14),highest number of cobs/ha (166296.3),maximum yield with husk (261.39 q/ha),maximum yield without husk (53.71 q/ha) and highest green fodder yield (37.00 t/ha) was observed in 60 kg N + 4 sprays of 3% Panchagavya which is significantly superior over rest of the treatments.The higher yield attributes obtained with the effect of hormonal substances present in panchagavya especially cytokinin which plays a role in vegetative plant parts with nutrient partitioning while in reproductive parts, high levels of nutrient mobilization. Foliar application of panchagavya readily supplied nutrients and growth hormones *viz*. IAA and GA3 present in panchagavya which might have stimulated the production of growth regulators in cell system .Similar results of higher gross and net returns were obtained with the application of panchagavya by Yadav and Lourduraj (2006) in rice and Somasundaram (2003) in greengram. The significant effect of panchagavya was mainly attributed to its nutrient content, higher biological activity and presence of plant growth promoting substances, which was confirmed by Hazarika *et al*. (2006).

Hence, the present investigation revealed that 60 kg N + 4 sprays of 3% Panchagavya would produce maximum growth and yield attributes and can be recommended for baby corn cultivation.

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