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# Effect of chemicals on quality of baby corn (*Zea mays* L.)

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## Abstract
An investigation was carried out on "Effect of chemicals on growth, yield and quality of baby corn (*Zea mays* L.)" at Horticulture Polytechnic, ACHF, NAU, Navsari, and Gujarat, India during summer 2020. The experiment was laid out in randomized block design (RBD) with eight treatments *viz*., $T_1$: $GA_3$ 40 ppm; $T_2$: NAA 40 ppm; $T_3$: mepiquat chloride 200 ppm; $T_4$: cystocele 200 ppm; $T_5$: paclobutrazol (PBZ) 200 ppm; $T_6$: putrescine 50 ppm; $T_7$: PBZ 200 ppm Seed soaking and $T_8$: Control which, were replicated thrice. All the chemicals were applied as foliar spray at 30 DAS, except $T_7$ treatment. In this treatment seeds were soaked on previous day in PBZ 200 ppm for three hours and kept in shade. The results revealed that foliar application of $GA_3$ 40 ppm indicated distinguished effect on quality of baby corn. Fresh and dry baby corn samples were analysed and higher total sugar content (2.35% and 6.95%, respectively), reducing sugar content (1.78% and 5.49%, respectively) and protein content (25.87 mg $g^{-1}$ and 63.30 mg $g^{-1}$, respectively) were obtained in $T_1$ treatment.

**Keywords:** Baby corn, $GA_3$, mepiquat chloride, NAA, paclobutrazol (PBZ), putrescence

## Introduction
Baby corn is seen as a viable option for increasing farmer revenue. The sweet succulent and tasty baby corn is a medium plant variety that produces green ears 65 to 75 days after planting. Baby corn is becoming popular as a vegetable and salad ingredient in and around major cities throughout the world. Because of its short length, it allows for the planting of a second crop as an intercrop and allows farmers to increase cropping intensity to increase returns per unit area per unit time (Rani *et al.*, 2015) [10].

Baby corn is grown efficiently for vegetable use in Asian nations such as Thailand, Taiwan, Sri Lanka, and Burma. Because of its potential as a value-added product for export and an excellent food alternative, it has grown into a multibillion-dollar business. Baby corn farming is something new in India, and the business is still in the early stages. Meghalaya, Western Uttar Pradesh, Haryana, Maharashtra, Gujarat, Karnataka, and Andhra Pradesh are the only states where it is being grown seriously. The lack of awareness about the usage and economic relevance of baby maize, as well as the absence of proper production equipment, are the primary barriers to its widespread adoption among Indian maize producers. In Gujarat, there are ample opportunities to increase baby maize production as an additional kharif vegetable crop in places with low to medium rainfall and as an additional summer vegetable crop in areas with irrigation infrastructure. The low water need and short duration are additional advantages for adopting or increasing the production of this crop.

The applications of gibberellin acid ($GA_3$) on growth of various plants have been reported by many scientists. Several studies on different crops have shown that the exogenous application of $GA_3$ and/or gibberellins can enhance the productivity of crops by affecting the vital physiological processes (Khan *et al*., 2002 and Bora and Sarma, 2003) [6, 1].

Naphthalene acetic acid (NAA) being an auxin, promotes vegetative growth by active cell division and cell enlargement and thus helped in improving growth characteristics and in stimulating reproductive phase also. Application of NAA significantly enhanced the fodder yield was the finding of Muthukumar *et al.* (2005) [8]. They also found positive influence of NAA on green cob yield of baby corn.

Cystocele (CCC) is a synthetic growth retarding chemical extensively used for dwarfing of plants or plant parts (Sarma and Mishra, 1979). Bora and Sarma (2004) [2] found that increasing cystocele concentration, increased yield of soybean and protein content of pea.

Mepiquat chloride is a growth retardant and reduces plant height resulted in effective translocation of photosynthesis from source to sink due to the shortening of distance between from source to sink due to the shortening of distance between source and sink, which in turn increases yield. Golada *et al*. (2018) [4] obtained higher cob yield due to increased mobilization of reserve food materials to developing sink through increase in hydrolyzing and oxidizing enzyme activities.

Role of paclobutrazol (PBZ) in improving the drought tolerance of crop plants by inducing antioxidant enzymatic activities is very well known and established finding by number of researchers. However, the lack of in-depth understanding of effects of paclobutrazol on morphological and physiological characteristics of roots in field crops under water deficit condition limits their application in crop plants (Kamran *et al.,* 2018) [5].

Polyamines (PAs) are ubiquitous polycations found in plants and other organisms that are essential for growth, development and resistance against abiotic and biotic stresses. The role of PAs in plant disease resistance depends on the relative abundance of higher PAs (spermicide and spermine) vs. the demine putrescence and PA catabolism. With respect to the pathogen, PAs are required to achieve successful pathogenesis of the host (Majumdar *et al.,* 2019) [7].

In spite of the promise and wide spread use of these chemicals, information of their use and their effect on baby corn is scanty, keeping these in mind a field experiment on this aspect was framed.

## Materials and Methods

A field experiment on baby corn var. GAYMH 1 was conducted at Horticulture Polytechnic, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India during summer 2020. The experiment was laid out in randomized block design with a set of treatments comprised of $GA_3$ 40 ppm ($T_1$); NAA 40 ppm ($T_2$); mepiquat chloride 200 ppm ($T_3$); CCC 200 ppm ($T_4$); paclabutrazol (PBZ) 200 ppm ($T_5$); putrescence 50 ppm ($T_6$); PBZ 200 ppm Seed soaking ($T_7$) and Control ($T_8$) replicated thrice. Seed soaking was done on previous day of sowing for 3 hrs. And kept in shade. Foliar application was done at 30 DAS. The soil of experimental site was well drain as well as medium water holding capacity and reasonably suitable for baby corn growing. The well decomposed farm yard manure (15 t $ha^{-1}$) and inorganic fertilizers as per recommended dose (120 kg N, 60 kg $P_2O_5$ and 0 kg $K_2O$ $ha^{-1}$) were applied in the form of urea and single super phosphate. The whole quantity of FYM applied to each plot after layout preparation and mixed thoroughly with the soil. Nitrogen (50%) and phosphorus (100%) were applied at the time of sowing. Remaining 50% nitrogen was applied at 30 DAS. The planting was done at the spacing 60 × 25 cm with gross plot size 2.4 × 2.5 m and net plot size 1.2 × 2.0 m.

Total nitrogen percentage from baby corn was determined by Kjeldahl method. The percentage of protein in the fresh and dry cobs was calculated by multiplying total nitrogen with factor 6.25 (Scheffelen *et al.*, 1961) [11]. Percentage of protein obtained by this method was later converted into mg $g^{-1}$. Total sugar was determined, in pulp extract, using the enthrone method of Yemm and Willis (1954) [15]. Reducing sugar were determined according to the technique described by Somogyi (1952) [12]. Statistical analysis was done as per the methods described by Panse and Sukhatme (1985) [9].

## Results and Discussion

### Total Sugar (%)

The data regarding to total sugar from fresh and dry baby corn (Table 1) were found significant due to different chemical treatments.

The total sugar content from fresh baby corn varied from maximum 2.35% to minimum 2.05%. Higher total sugar (2.35%) from fresh baby corn was found from $T_1$ ($GA_3$ 40 ppm) treatment and it was statistically remained at par with $T_2$ (2.33%), $T_4$ (2.29%), $T_6$ (2.26%) and $T_8$ (2.21%) treatments. Minimum total sugar (2.05%) was obtained under treatment $T_7$ (PBZ 200 ppm Seed soaking).

Same treatment *i.e.,* $T_1$ ($GA_3$ 40 ppm) performed best and recorded higher concentration of total sugar (6.95%) obtained from dry baby corn, which was statistically at par with $T_2$ (NAA 40 ppm) treatment. Similarly, minimum concentration of total sugar from dry baby corn was analysed under treatment $T_7$ (PBZ 200 ppm Seed soaking) with 5.72% content.

**Protein Content (mg $g^{-1}$):** The outcomes regarding protein content from fresh and dry baby corn as influenced by different chemicals are given in Table 1.

A perusal of data reveals that the protein content from fresh baby corn was significantly influenced by different treatments under study.

The range of protein content from fresh baby corn varied from maximum 25.87 mg $g^{-1}$ to minimum 22.17 mg $g^{-1}$. Treatment $T_1$ ($GA_3$ 40 ppm) found best and recorded maximum protein content (25.87 mg $g^{-1}$) was obtained from fresh baby corn and it was statistically at par with $T_4$ (CCC 200 ppm), $T_5$ (PBZ 200 ppm) and $T_2$ (NAA 40 ppm) treatments. Minimum protein content (22.17 mg $g^{-1}$) was obtained under $T_8$ (control) treatment.

The data with respect to the protein content obtained from dry baby corn (Table 1), clearly indicates non-significant influence of different treatments. Though, treatment $T_1$ ($GA_3$ 40 ppm) performed better and recorded maximum protein content (63.30 mg $g^{-1}$) from dry baby corn. Minimum protein content (57.40 mg $g^{-1}$) was detected under $T_8$ (control) treatment.

### Reducing Sugar (%)

Application of different chemicals imposed significant difference on reducing sugar content of fresh and dry baby corn samples, which are tabulated in Table 1.

The information indicated that the reducing sugar from fresh baby corn varied from 1.78% to 1.46%. Treatment of $GA_3$ 40 ppm $T_1$ found best and recorded maximum content (1.78%) of reducing sugar from fresh baby corn samples, which was statistically at par with $T_2$ (NAA 40 ppm), $T_4$ (CCC 200 ppm) and $T_6$ (putrescence 50 ppm) treatments, recorded 1.74%, 1.68% and 1.67% reducing sugar, respectively. The least reducing sugar (1.46%) obtained from fresh baby corn was observed under $T_3$ (mepiquat chloride 200 ppm) treatment.

Similar trend was observed for reducing sugar content analysed from dry baby corn samples and maximum concentration (5.49%) was recorded in same $T_1$ treatment, which was statistically remained at par with $T_2$ (5.16%) and $T_4$ (5.07%) treatments. Similarly, minimum concentration (4.49%) was recorded with $T_3$ treatment.

**Table 1:** Effect of different chemicals on quality parameters of baby corn var. GAYMH 1

| Treatments | Total sugar (%) | | Reducing sugar (%) | | Protein content (mg $g^{-1}$) | |
|---|---|---|---|---|---|---|
| | Fresh | Dry | Fresh | Dry | Fresh | Dry |
| $T_1$: $GA_3$ 40 ppm | 2.35 | 6.95 | 1.78 | 5.49 | 25.87 | 63.30 |
| $T_2$: NAA 40 ppm | 2.33 | 6.42 | 1.74 | 5.16 | 24.60 | 57.77 |
| $T_3$: Mepiquat chloride 200 ppm | 2.09 | 6.13 | 1.46 | 4.49 | 22.63 | 60.20 |
| $T_4$: CCC 200 ppm | 2.29 | 6.37 | 1.68 | 5.07 | 24.70 | 61.47 |
| $T_5$: PBZ 200 ppm | 2.08 | 5.96 | 1.60 | 4.62 | 24.63 | 61.70 |
| $T_6$: Putrescence 50 ppm | 2.26 | 6.11 | 1.67 | 4.69 | 23.73 | 59.43 |
| $T_7$: PBZ 200 ppm (Seed soaking) | 2.05 | 5.72 | 1.54 | 4.54 | 22.87 | 58.07 |
| $T_8$: Control | 2.21 | 6.09 | 1.62 | 4.66 | 22.17 | 57.40 |
| S.Em. ± | 0.06 | 0.18 | 0.05 | 0.17 | 0.62 | 1.48 |
| C.D. at 5% | 0.18 | 0.54 | 0.15 | 0.52 | 1.90 | NS |
| C.V. % | 4.58 | 4.98 | 5.41 | 6.16 | 4.50 | 4.28 |

Significantly higher total and reducing sugar of fresh and dry samples of baby corn was obtained from the treatment, which received foliar spray of $GA_3$ (40 ppm) at 30 DAS. Vani and Kumar (2014) [13] obtained similar kind of results in baby corn and described that spray of $GA_3$ resulted in better retention of sugars due to the lower rate of respiration and lower enzymatic activity, which ultimately slower down the rate of sugar utilization for respiration.
Protein content of fresh baby corn was also found significant in treatment of $GA_3$ 40 ppm. This might be due to plant hormones that acted solely or in part for controlling transcription of genes and thus levels of mRNA which would, in turn regulates rate of synthesis of specific hormone induced proteins (Bora and Sarma, 2006) [3]. The present finding is in conformity with Bora and Sarma (2006) [3].

## Conclusions
The quality parameters of cobs were analysed on fresh and dry weight basis. Higher total sugar content (2.35% and 6.95%, respectively), reducing sugar (1.78% and 5.49%, respectively) and protein content (25.87 mg $g^{-1}$ and 63.30 mg $g^{-1}$, respectively) were obtained with application of $GA_3$ 40 ppm ($T_1$). Vani and Kumar (2014) [13] obtained similar kind of results in baby corn and described that spray of $GA_3$ resulted in better retention of sugars due to the lower rate of respiration and lower enzymatic activity which ultimately slower down the rate of sugar utilization for respiration.

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