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Effect of nitrogen, phosphorus and potassium levels on growth and yield of stevia (*Stevia rebaudiana* Bertoni.)*

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Abstract: A field experiment was conducted in medium black, clayey soil under irrigated conditions to assess the response of stevia to levels of nitrogen, phosphorus and potassium. Five cuttings (crops) were taken in a year. Pooled results indicated that significantly higher dry leaf yield was obtained with nitrogen @ 400 kg ha^{-1} (11.42 t ha^{-1}) and it was on par with 300 kg ha^{-1} (10.94 t ha^{-1}). Phosphorus @ 200 kg ha^{-1} recorded significantly highest dry leaf yield (11.14 t ha^{-1}) and it was on par with 150 kg ha^{-1} (10.85 t ha^{-1}). Potassium @ 200 kg ha^{-1} recorded dry leaf yield of 10.78 t ha^{-1} and it was comparable with potassium @100 kg ha^{-1} (10.46 t ha^{-1}). The growth parameters *viz.*, plant height, number of branches plant^{-1} and number of leaves plant^{-1} were significantly higher with nitrogen, phosphorus and potassium @ 400 kg ha^{-1}, 200 kg ha^{-1} and 200 kg ha^{-1}, respectively which were on par with 300 kg ha^{-1}, 150 kg ha^{-1} and 100 kg ha^{-1} respectively. In pooled data nitrogen @ 400 kg ha^{-1} (N_2) recorded the highest B:C (3.01) which was on par with nitrogen @ N_2 *i.e.*, 300 kg ha^{-1} (2.93), but significantly higher than N_1 *i.e.*, 200 kg ha^{-1} (2.66). Phosphorous P_3 *i.e.*, 200 kg ha^{-1} resulted in higher B:C (2.96) which was on par with P_2 *i.e.*, 150 kg ha^{-1} (2.91). Potassium level influenced the B:C non-significantly. Significantly lowest B:C were recorded with absolute control in pooled data (2.14). Interactions of N, P and K were non-significant. Nutrient level of 300:150:100 kg ha^{-1} NPK applied in equal splits to five cuttings (Crops) in year has been considered as an economically optimum level of nutrients for stevia.

Key words: Nitrogen, Phosphorus, Potassium, Stevia, Uptake

Introduction

Stevia (*Stevia rebaudiana* Bertoni.) is a herbaceous perennial small bush contaning carbohydrate based compounds in its leaves, which are many times sweeter than cane sugar and sugarbeet. Dry leaves are the economic part in stevia plant. Stevia leaves have taste 20-30 times sweeter than cane sugar but impotantly without any calories. Hence, stevia is a potential natural source of no calorie sweetner, alternative to the synthetic sweetening agents like saccharine, aspartame, asulfam-K that are available in the market to the diet conscious consumers and diabetics. Cultivation of stevia crop made significant impact in the countries like Japan, China, Korea, Mexico, USA, Thailand, Malaysia, Indonesia, Australia, Canada and Russia (Brandel and Rosa, 1992). Studies conducted in India so far could suggest only few management approaches for improving productivity. Since the production potential of stevia in India is 2-3 t ha^{-1} of dry leaves as against 1-2 t ha^{-1} in China, it has definite advantage over China (Chalapathi *et al.*, 1997 b). Stevia can be cultivated profitably wherever irrigation facilities are available. In India some research work was carried out at University of Agricultural Sciences, Bengaluru in Karnataka and at the Institute of Himalayan Bioresource Technology (IHBT), Palampur, Himachal Pradesh during 1996 and 2003, respectively (Megeji *et al.*, 2005). There is no adequate information on nutrient requirement for stevia. The present investigation was undertaken to determine the optimum N, P and K levels for higher dry leaf yield of stevia.

Material and methods

A field experiment was conducted at Water Management Research Center (WMRC), Belavatagi, (Ta: Navalagund, Dist: Dharwad) under irrigated conditions during 2004-05 to 2005-06. It is located in semi-arid tract of Karnataka at 15^o 34' N latitude and 75^o 21' E longitude at an altitude of 578 m above mean sea level. The soil of the experimental site was medium black, clayey soil (Vertisols) with a depth of more than 1.5 m having high water holding capacity (78 %) and low infiltration rate (0.25 cm ha^{-1}) The pH and Ec of the soil was 8.1 and 0.23 dSm^{-1} respectively, with organic carban of 0.64%, available N, P_2O_5 and K_2O were 285 kg ha^{-1}, 26 kg ha^{-1} and 620 kg ha^{-1} respectively. The initial composite soil samples from both the sites were collected from 0 to 30 cm soil depth before commencement of the experiment. The experiment consisted of 3 levels of nitrogen (N_1 - 200 kg ha^{-1}, N_2 - 300 kg ha^{-1}, N_3 - 400 kg ha-$^{-1}$), 3 levels of phosphorous (P_1 - 100 kg ha^{-1}, P_2 - 150 kg ha^{-1}, P_3 - 200 kg ha^{-1}), and 2 levels of potassium (K_1 - 100 kg ha^{-1}, K_2 - 200 kg ha^{-1}). All nutrients in each treatment were applied in equal splits for five cuttings (Crops) in a year including plant crop. The treatments were laid out in randomized block design with factorial concept in three replications and one absolute control with out any nutrients as check. Two months old stevia seedlings were planted with a common spacing

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