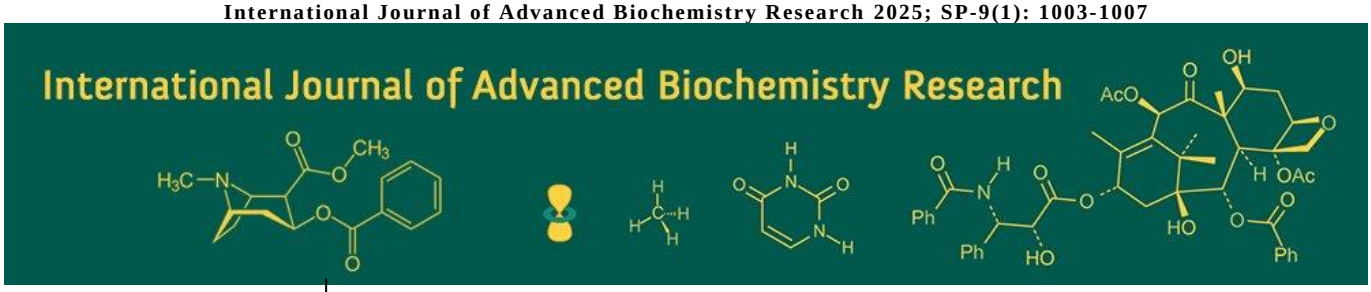

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Evaluate the effect of different treatments on leaf nutrient status at various growth stages of cashew nut (*Anacardium occidental* L) in lateritic soils of Konkan

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Abstract
An attempt has been made to study the effect of different levels of nitrogen, phosphorus and potassium along with soil and foliar application of zinc and boron on yield and quality of cashew nut (*Anacardium occidentale* L.) Variety Vengurla-4 in lateritic soil of Konkan during May 2015 to April 2016 in Randomized Block Design with four levels of NPK (1.0:0.25:0.25, 1.0:0.50:0.50, 1.5:0.75:0.75 and 2.0:1.0:1.0 kg NPK per tree) with or without soil application of boron through borax @ 50 g + zinc through zinc sulphate @ 125 g/tree or foliar application of boron through borax @ 0.25% + zinc through zinc sulphate @ 0.5% /tree, an absolute control (to judge the fate of native nutrients) comprising thirteen treatments replicated thrice. Application of 1.0:0.50:0.50 NPK kg/tree + foliar application of boron through borax @ 0.25% + zinc through zinc sulphate @ 0.5% / tree (T_{11}) recorded significantly higher total nitrogen and copper in cashew nut leaves, while Application of 2.0:1.0:1.0 NPK kg/ tree + boron through borax @ 0.25% + zinc through zinc sulphate @ 0.5%/tree (T_{13}) recorded significantly higher total micronutrient (*viz.*, Mn, Zn and B) in cashew nut leaves and also micronutrient (*viz*., Fe, Mn, Zn and Cu) in cashew kernel.By considering the higher yield of cashew nut, protein and oil content, NPK and micro-nutrient (*i.e*. Fe, Mn, Cu, Zn and B) content in leaf at different growth stages of cashew (*i.e.* at new emergence shoot stage, flowering stage, nut setting stage and at harvest), application 1.0:0.50:0.50 kg NPK per tree along with spraying of foliar application of boron though borax @ 0.25% + zinc through zinc sulphate @ 0.5% was to be beneficial in lateritic soils of Konkan.

Keywords: Cashewnut, NPK, Zn, B, foliar spray, lateritic soil

Introduction
Cashewnut is one of the most important dollar earning crop among the horticulture and plantation crops in the country. At present cashew is grown over an area of 9.23 lakh ha with a production of 6.13 lakh MT in India; however the productivity is only 695 kg ha^{-1} (Anonymous 2016) [1]. In India, cashew is mainly grown in Maharashtra, Karnataka, Kerala and Goa along the west coast Tamilnadu, Andhra Pradesh, Orissa and West Bengal along the east coast. Maharashtra is ranking first in area, production and productivity in the country with 1.75 lakh ha area, 1.90 lakh MT production and about 1186 kg ha^{-1} productivity, respectively. The cashew production in Maharashtra is mainly concentrated in Konkan region particularly in Ratnagiri, Sindhudurg, and Raigad and west part of Kolhapur district. In Ratnagiri, area under cashew is 88,612 ha with production of 85,822 tons of cashew nuts. The total export of cashew kernels from India during 2015-16 was 96,346 MT valued at Rs. 4952.12 Crore (Anonymous 2016) [1].
Cashew is a perennial crop requiring about five years to bearing from the year of plantation. The commercial bearing starts from seven year onward and continues up to Forty years. It is also important from the view point of its nutritive value, valuable foreign exchange and considerable employment generation potential. The cashew is also becoming an important crop due to its utility for soil and water conservation and to build up balanced ecosystem. Cashew kernel is used for human consumption. It is also used in confectionary industry, having high nutritive value. Besides, cashew apple yields juice which is rich in sugar and ascorbic acid, as well as protein and minerals. The cashew apple can be used for preparation of ready to serve (RTS) juice, squash, syrup, jam, candy and wine.

The cashew nut shell liquid (CNSL) which is extracted from the shell during processing is widely used in preparation of water proofing agents, insulating varnishes, industrial flouring tiles, automobile brake linings, adhesive ingredients, ink, oil cloth paints and cardboard finishing reagents. Cashew wood also provides gum like gum Arebica, shipping crate, charcoal etc.

Cashew tree is a hardy drought resistance plant, but is very sensitive to frost. It can be cultivated in a wide variety of soils. In India, even cashew is a crop of marginal land. Its distribution extends upto 27^0 N and 28^0 S latitudes. It's distribution is restricted to altitude below 700 m, when temperature does not fall below 20 °C for prolonged period. It requires minimum rainfall of 50 cm. per annum but can withstand it from 300-400 cm.

Material and Methods

The experiment was laid out at Rukhi Block of Irrigation Water Management, Central Experimental Station, Wakawali during May 2016 to April 2017 in Randomized Block Design with four levels of NPK (1.0:0.25:0.25, 1.0:0.50:0.50, 1.5:0.75:0.75 and 2.0:1.0:1.0 kg NPK per tree) with and without soil application of boron through borax @ 50 g + zinc through zinc sulphate @ 125 g/tree or foliar application of boron through borax @ 0.25% + zinc through zinc sulphate @ 0.5% /tree, an absolute control (to judge the fate of native nutrients) comprising thirteen treatments replicated thrice. Two trees were selected for each treatment. Total seventy eight uniform cashew trees of variety *Vengurla*-4 were selected from the orchard at the slope of the hill.

Four levels of NPK (1.0:0.25:0.25, 1.0:0.50:0.50, 1.5:0.75:0.75 and 2.0:1.0:1.0 kg NPK per tree)through urea, single super phosphate and muriate of potash along with FYM @ 40 kg $tree^{-1}$ and soil application of boron through borax @ 0.25% and zinc through zinc sulphate @ 0.5% were applied in corresponding treatments in the month of June 2015. The spraying of boron through borax @ 0.25% and zinc through zinc sulphate @ 0.5% in the pertinent treatments (T_{10} to T_{13}) were under takenat time of flowering and nut setting stage in June 2016.The boron and zinc solutions for foliar application were prepared by using borax @ 0.25% and zinc sulphate@ 0.5% /tree fertilizer by dissolving the respective weight of chemical fertilizers in 1L of water by continuous stirring. Further, insecticides (endosulphon, rogar and carboxyl) were also added to these spraying solutions for control of pest incidence.The spraying wascarried out early in the morning by using Gatoorpump. The cashew nuts were picked when the cashew apple were fully ripened and harvested in 5-6 picking.

Results and Discussion

Leaf nutrient status of cashew varied with physiological phases. Based on the nutrient uptake reported by Bhaskar (1993) [14] it can be seen that nitrogen is the element that is required by cashew in largest quantity followed by potassium. Calcium comes third in that order followed by P, Mg, S, Fe, Zn, Mn and Cu. Studies the nutrient composition of one year vegetative and reproductive growth of a 30 year old cashew tree and determined the N:P;K ratio as 8.6:1.0:3.2.

It revalued from the data that the different levels of inorganic fertilizers with soil and foliar application of Zn and B significantly affected the nitrogen content in leaves of cashew nut at different growth stages (*i.e.* at new emergence shoot stage, flowering stage, nut setting stage and at harvest) during 2015-16 (except at harvest) and 2016-2017.

During first year 2015-16, the nitrogen content in leaves of cashew nut varied between 0.33 to 1.44 percent at new emergence shoot stage, 0.22 to 1.43 percent at flowering stage, 0.14 to 0.77 percent at nut setting stage and 0.28 to1.16 percent at harvest stage indicating thereby that the nitrogen content in leaves of cashew nut decreased from new emergence shoot stage to nut setting stage and further increased at harvest stage irrespective of the treatments.

Alike first year, during second year 2016-17, the nitrogen content in leaves of cashew nut varied between 0.33 to 2.02 percent at new emergence shoot stage, 0.31 to 1.48 percent at flowering stage, 0.20 to 0.84 percent at nut setting stage and 0.29 to 1.05 percent at harvest stage indicating thereby that the nitrogen content in leaves of cashew nut decreased from new emergence shoot stage to nut setting stage and further increased at harvest stage irrespective of the treatments.

In this context, Ghosh and Bose (1986) [3] noted that nitrogen content in leaf was lowest in the month of April which increased subsequently and reached the maximum level in the month of December. The maximum nitrogen content in December might be due to accumulation of metabolites. Similar results were obtained by Harishu Kumar (1982) [5] in cashew. The decline in leaf nitrogen content in April was due to translocation of metabolites to the growing fruit.

Similar ranges of N content in cashew leaves of Cv. Vengurla-4 grown on lateritic soils of Konkan at new emergence shoot stage, flowering stage, nut setting stage and harvest stage were also reported by Palsande (2011) [10] and by Palkar (2014) [8] at flowering stage and at harvest stage.

Significant variation in N content of leaves could be observed due to the application of NPK levels without and with soil and foliar application of boron through borax and zinc through and zinc sulphate at all stages of fruit development over control.

During first year 2015-16, the highest N content i.e. 1.44 percent at new emergence shoot stage, 1.43 percent at flowering stage, 0.77 percent at nut setting stage and 1.16 percent at harvesting stage were observed in treatment T_{11} i.e. 1.0:0.50:0.50 NKP + foliar application of boron through borax @ 0.25% + zinc through zinc sulphate @ 0.5% /tree; where at new emergence shoot stage treatment T_{11} was at par with treatments T_2 (1.0:0.25:0.25 kg NPK), T_5 (2.0:1.0:1.0 kg NPK), T_6 (1.0:0.25:0.25 kg NPK + Soil application of B + Zn), T_7 (1.0:0.50:0.50 kg NPK + Soil application of B + Zn) and T_{13} (2.0:1.0:1.0 kg NPK + Foliar application of B + Zn) and significantly superior over rest the treatments. Further, at flowering stage treatment T_{11} was at par with treatment T_5 (2.0:1.0:1.0 kg NPK) and significantly superior over rest the treatments, followed by T_2 (1.0:0.25:0.25 kg NPK) and T_{13} (2.0:1.0:1.0 kg NPK + Foliar application of B + Zn). At nut setting stage treatment T_{11} was at par with treatments T_3 (1.0:0.50:0.50 kg NPK), T_8 (1.5:0.75:0.75 kg NPK + Soil application of B + Zn), T_{10} (1.0:0.25:0.25 kg NPK + Foliar application of B + Zn), T_{12} (1.5:0.75:0.75 kg NPK + Foliar application of B + Zn) and T_{13} (2.0:1.0:1.0 kg NPK + Foliar application of B + Zn). The data further indicated that at harvest stage the application of different levels of inorganic fertilizers without

and with soil and foliar application of Zn and B did not influence significantly theN content in cashew leaves during 2015-16.

During the second year 2016-17, the highest N content i.e. 2.02 percent at new emergence shoot stage, 1.48 percent at flowering stage, 0.84 percent at nut setting stage and 1.05 percent at harvesting stage was observed in treatment T_{11} i.e. 1.0:0.50:0.50 NKP + foliar application of boron through borax @ 0.25% + zinc through zinc sulphate @ 0.5% /tree; where at new emergence shoot stage treatment T_{11} was significantly superior over all other treatments and followed by T_2 (1.0:0.25:0.25 kg NPK) and T_3 (1.0:0.50:0.50 kg NPK). Further, at flowering stage treatment T_{11} was at par with treatments T_3 (1.0:0.50:0.50 kg NPK), T_9 (2.0:1.0:1.0 kg NPK + Soil application of B + Zn) and T_{10} (1.0:0.25:0.25 kg NPK + Foliar application of B + Zn). At nut setting stage treatment T_{11} was significantly superior over all other treatments and followed by T_5 (2.0:1.0:1.0 kg NPK) and T_3 (1.0:0.50:0.50 kg NPK). The data further indicated that at harvest stage treatment T_{11} was at par with treatments T_2 (1.0:0.25:0.25 kg NPK), T_3 (1.0:0.50:0.50 kg NPK), T_4 (1.5:0.75:0.75 kg NPK), T_5 (2.0:1.0:1.0 kg NPK), T_6 (1.0:0.25:0.25 kg NPK + Soil application of B + Zn), T_7 (1.0:0.50:0.50 kg NPK + Soil application of B + Zn), T_8 (1.5:0.75:0.75 kg NPK + Soil application of B + Zn), T_9 (2.0:1.0:1.0 kg NPK + Soil application of B + Zn), T_{10} (1.0:0.25:0.25 kg NPK + Foliar application of B + Zn) and T_{13} (2.0:1.0:1.0 kg NPK + Foliar application of B + Zn).

The increase in N content of leaves due to foliar spray may be attributed to the fact that the higher supply of nitrogen would have increased the absorption as well as utilization by the plant which ultimately results in higher nitrogen content of the leaves. The similar result were observed by Ankaiah and Venkatrao (1983) [2] and Kalusingh*et al.*, 1983). Further, increase in N content of cashew leaves with the increase level of potassium was also reported by Ghosh and Bose (1986b) [3].

It can be seen from the data that N content in leaf gradually decrease with fruit development irrespective of the doses of spray, which could be consequence of ion translocation to the developing fruit (Bezerra *et al.*, 2007 and Harishukumar *et al.*, 1982) [5]. In lateritic soils of West Bengal, Ghosh and Bose (1986b) [3] recorded the highest concentration of leaf and shoot nitrogen in December and the lowest in April, irrespective of the dose of fertilizer treatment. Further, Harishukumar and Nair (1980) [4] reported that foliar N content was lowest at the end of fruiting season (April to July) which increase gradually till October and reached the highest level in December. Palsande *et al.* (2013) [9] also reported the decreasing trend of leaf N content in cashew leaves of Cv. Vengurla-4 grown on lateritic soils of Konkan from new emergence shoot stage to the harvest stage.

The nitrogen content in leaf was found to decrease gradually from March to August and increased thereafter during September to November. The N content in leaf during September to November in leaf tissues was recorded maximum in November (2.76%) fallowed by in March (2.62%) while it was minimum in month of February and August (1.96%). According to the concentration of nitrogen in leaf was high at flushing and early flowering phase. Leaf N was highest (2.76%) in flowering phase and lowest (1.24%) in pre-flushing phase. The leaf N content was highest (3.02%) at flowering and lowest (1.93%) at flushing phase. Bhaskar (1993) [14] reported highest leaf N concentration at flushing and early flowering phases and lowest at fruiting and maturity phases.

Increase in N application from 150 to 300 g/tree/year increased leaf N content from 2.04 to 2.53% in cashew. Variation in leaf N concentration ranging from 1.2 to 3.24% was reported by Gopikumar and Arvindakshan (1988) [15] in cashew seedlings. The leaf N increased from 2.46 to 3.02 with increase in N level from 250 to 1000 g/tree/year. The leaf N content decreased from 2.06 to 1.56% with increase in age of the plant from 6 to 70 months (Richard 1992) [11]. The leaf N content varied with leaf position. It was highest (2.76%) in younger leaves and lowest (1.24%) in older leaves.

The leaf P content varied with physiological phase of the plant. Different levels of inorganic fertilizers with soil and foliar application of Zn and B significantly affected the phosphorus content in leaves of cashew nut at different growth stages (*i.e.* at new emergence shoot stage, flowering stage, nut setting stage and at harvest) during 2015-16 and 2016-2017 and the data has been presented in.

During first year 2015-16, the phosphorus content in leaves of cashew nut varied between 0.026 to 0.102 percent at new emergence shoot stage, 0.025 to 0.077 percent at flowering stage, 0.082 to 0.199 percent at nut setting stage and 0.058 to 0.106 percent at harvestingstage. Alike first year, during second year 2016-17, the phosphorus content in leaves of cashew nut varied between 0.019 to0.115 percent at new emergence shoot stage, 0.020 to 0.076 percent at flowering stage, 0.058 to 0.104 percent at nut setting stage and 0.056 to 0.107 percent at harvesting stage. Close scrutiny of the data indicated that a specific trend of increase or decrease was not observed with different treatment combinations; but, by and large, phosphorus content in leaves of cashew nut increased at nut setting stage over to its previous stages i.e. new emergence shoot stage and flowering stage and further decreased at harvest stage.

Similar ranges of phosphorus content in cashew leaves of Cv. Vengurla-4 grown on lateritic soils of Konkan at new emergence shoot stage, flowering stage, nut setting stage and harvest stage were also reported by Palsande (2011) [10]. Palkar (2014) [8] also reported the similar ranges of phosphorus content in cashew leaves Cv. Vengurla-4 grown on lateritic soils of Konkan at flowering stage and at harvest stage.

Significant variation in phosphorus content of leaves could be observed due to the application of NPK levels alone or with soil and foliar application of boron through borax and zinc through and zinc sulphate at all stages of fruit development over control.

During first year 2015-16, the highest phosphorus content i.e. 0.102 percent at new emergence shoot stage, 0.077 percent at flowering stage, 0.199 percent at nut setting stage and 0.106 percent at harvesting stage was observed in treatment T_6 i.e. 1.0:0.25:0.25 kg NPK + soil application of boron through borax @ 50 g + zinc through zinc sulphate @ 125 g/tree; where at new emergence shoot stage treatment T_6 was significantly superior over all other treatments and among other treatments T_{10} (1.0:0.25:0.25 kg NPK + Foliar application of B + Zn), T_{11} (1.0:0.50:0.50 kg NPK + Foliar application of B + Zn) and T_{12} (1.5:0.75:0.75 kg NPK + Foliar application of B + Zn). Further, at flowering stage treatment T_6 was significantly superior over all other treatments and among other treatments T_2 (1.0:0.25:0.25 kg NPK) and T_3 (1.0:0.50:0.50 kg NPK) were at par. At nut

setting stage treatment T_6 was at par with treatments T_4 (1.5:0.75:0.75 kg NPK) and was followed by T_2 (1.0:0.25:0.25 kg NPK). The data further indicated that at harvest stage treatment T_6 was at par with treatments T_5 (2.0:1.0:1.0 kg NPK) and T_{13} (2.0:1.0:1.0 kg NPK + Foliar application of B + Zn).

During the second year 2016-17, the highest phosphorus content i.e. 0.115 percent at new emergence shoot stage, 0.076 percent at flowering stage, 0.104 percent at nut setting stage were observed with treatment T_6 i.e. 1.0:0.25:0.25 kg NPK + soil application of boron through borax @ 50 g + zinc through zinc sulphate @ 125 g/tree and 0.107 percent at harvesting stage was observed treatment T_5 i.e. 2.0:1.0:1.0 kg NPK/tree, where at new emergence shoot stage treatment T_6 was at par with T_3 (1.0:0.50:0.50 kg NPK) and T_{13} (2.0:1.0:1.0 kg NPK + Foliar application of B + Zn).

Further, at flowering stage treatment T_6 was significantly superior over all other treatments and followed by T_3 (1.0:0.50:0.50 kg NPK) and T_2 (1.0:0.25:0.25 kg NPK). At nut setting stage treatment T_6 was at par with T_{11} (1.0:0.50:0.50 kg NPK + Foliar application of B + Zn) and T_{13} (2.0:1.0:1.0 kg NPK + Foliar application of B + Zn). The data further indicated that at harvest stage treatment T_5 was at par with treatments T_2 (1.0:0.25:0.25 kg NPK),T_4 (1.5:0.75:0.75 kg NPK), T_{11} (1.0:0.50:0.50 kg NPK + Foliar application of B + Zn) and T_{13} (2.0:1.0:1.0 kg NPK + Foliar application of B + Zn).

The variation in phosphorus content in cashew leaves were associated with leaf age and the phonological changes of the plant over the period of fruit development (Bezerra *et al.*, 2007). A similar change of P content in cashew leaves was reported by Sanyal and Mitra (1991). Ghosh and Bose (1986b) [3] reported that as the level of nitrogen increased, the P content in leaf also increased up to the higher level in the cashew plant.

Increase in the phosphorus content in leaf of cashew due to P application was reported by Harishu Kumar (1982) [5]. It was also noted that phosphorus content in leaf was markedly influenced by the application of nitrogen. As the level of nitrogen increased, the P content in leaf also increased upto the highest level. Application of potassium slightly influenced the P content in leaf. Reported that the K, P and Na increased in all parts of cashew with increased level of potassium. The leaf P was found low in the month of April due to utilization by the growing fruits, but increased in August and the highest range was obtained in December. Reddy *et al*. (1982) [16] reported that P content in plant tissue of cashew increased gradually from August and reached the maximum value in December thereafter it again declined.

The leaf P content was highest (0.16%) in fruiting phase and lowest (0.072%) in flushing phase. Bhaskar (1993) [14] reported the occurrence of highest leaf P content at early flowering phase and lowest at fruiting phase.

According to Haag *et al*. (1975) [17], leaf P content ranging from 0.16 to 0.20% indicate sufficiency where as P content ranging from 0.11 to 0.14% indicate P deficiency in cashew. Increase in P application from 50 to 150 g/tree/year increased leaf P content from 0.11 to 0.16% in cashew. Increase in P application increased leaf P content from 0.072 to 0.16% upto a dose of 500 g P_2O_5/tree/year. The leaf P content increased from 0.045 to 0.136 with increase in age of the plant from 6 to 70 months (Richard 1992) [11]. The leaf P content varied with leaf position. It was highest (2.76%) in seventh and eighth leaf and lowest (1.24%) in first leaf from the inflorescence.

The leaf K content varied with physiological phase of the plant. Different levels of inorganic fertilizers with soil and foliar application of Zn and B significantly affected the potassium content in leaves of cashew nut at different growth stages (*i.e.* at new emergence shoot stage, flowering stage, nut setting stage and at harvest) during 2015-16 and 2016-2017.

During first year 2015-16, the potassium content in leaves of cashew nut varied between 0.115 to 0.227 percent at new emergence shoot stage, 0.176 to 0.390 percent at flowering stage, 0.129 to 0.460 percent at nut setting stage and 0.089 to 0.443 percent at harvest stage. Alike first year, during second year 2016-17, the potassium content in leaves of cashew nut varied between 0.138 to 0.277 percent at new emergence shoot stage, 0.112 to 0.305 percent at flowering stage, 0.162 to 0.474 percent at nut setting stage and 0.116 to 0.439 percent at harvest stage. Similar ranges of potassium content in cashew leaves of Cv. Vengurla-4 grown on lateritic soils of Konkan at new emergence shoot stage, flowering stage, nut setting stage and harvest stage were also reported by Palsande (2011) [10]. Palkar (2014) [8] also reported the similar ranges of potassium content in cashew leaves Cv. Vengurla-4 grown on lateritic soils of Konkan at flowering stage and at harvest stage.

Significant variation in potassium content of leaves could be observed due to the application of NPK levels alone or with soil and foliar application of boron through borax and zinc through and zinc sulphate at all stages of fruit development over control.

During first year 2015-16, the highest potassium content i.e. 0.227 percent at new emergence shoot stage, 0.390 percent at flowering stage, 0.460 percent at nut setting stage and 0.443 percent at harvesting stage was observed in treatment T_7 i.e. 1.0:0.50:0.50 kg NPK + soil application of boron through borax @ 50 g + zinc through zinc sulphate @ 125 g/tree; where at new emergence shoot stage treatment T_7 at par with T_{12} (1.5:0.75:0.75 kg NPK + Foliar application of B + Zn) and was significantly superior over all other treatments and among other treatments T_4 (1.5:0.75:0.75 kg NPK) and T_{13} (2.0:1.0:1.0 kg NPK + Foliar application of B + Zn) were at par. Further, at flowering stage treatment T_7 was at par with T_4 (1.5:0.75:0.75 kg NPK), T_5 (2.0:1.0:1.0 kg NPK) and T_{13} (2.0:1.0:1.0 kg NPK + Foliar application of B + Zn). At nut setting stage treatment T_7 was at par with T_5 (2.0:1.0:1.0 kg NPK/tree) and T_{11} (1.0:0.50:0.50 kg NPK + Foliar application of B + Zn); and at harvest the treatment $T_7$was significantly superior over all other treatments.

During the second year 2016-17, the highest potassium content i.e. 0.277 percent at new emergence shoot stage, 0.305 percent at flowering stage, 0.474 percent at nut setting stage and 0.439 percent at harvest was observed in treatment T_7 i.e. 1.0:0.50:0.50 kg NPK + soil application of boron through borax @ 50 g + zinc through zinc sulphate @ 125 g/tree; where at new emergence shoot stage treatment T_7 at par with T_{12} (1.5:0.75:0.75 kg NPK + Foliar application of B + Zn) and was significantly superior over all other treatments. Further, at flowering stage treatment T_7 was significantly superior over all other treatments and followed by T_{12} (1.5:0.75:0.75 kg NPK + Foliar application of B + Zn). At nut setting stage treatment T_7 was at par with and T_6 (1.0:0.25:0.25 kg NPK + Soil application of B + Zn) and T_{11} (1.0:0.50:0.50 kg NPK + Foliar application of B + Zn)

significantly superior over all other treatments. At harvest stage treatment T_7 was significantly superior over all other treatments and followed by T_3 (1.0:0.50:0.50 kg NPK).

Similar to P content, K content in the cashew leaf initially decline from new emergence shoot stage to harvesting stage, but further its concentration increased at harvest stage irrespective of the treatment. This trend of decreased K content indicated the depletion of nutrients due to consequence mobility of potassium ions to developing fruit. Similar results were also observed by Sathi Babu *et al.* (2010b), Sanyal and Mitra (1991) also observed similar results.

Increase in the K content of leaves with the foliar application of KNO_3 on mango was also elsewhere reported (Anonymous, 2016) [1]. Increased in K content in leaf tissue of cashew due to application of potassic fertilizer was reported by Harishukumar*et al.* (1982) [5]. Tandon (1992), in addition to this, reported that the K^+ ion increase NH_4^+ assimilation in plant.

According to Haag *et al*. (1975) [17], leaf K content ranging from 1.11 to 1.29% indicate sufficiency where as K content ranging from 0.20 to 0.26% indicate K deficiency in cashew. Increase in K application from 50 to 150 g/tree/year increased leaf K content from 0.85 to 0.98% in cashew. Increase in K application increased leaf K content from 1.14 to 1.23% when K level was increased from 0 to 1000 g K_2O/tree/year. The leaf P content decreased from 0.96 to 0.73% with increase in age of the plant from 6 to 70 months (Richard 1992) [11]. The leaf K content varied with leaf position. It was highest (2.74%) in seventh and eighth leaf and lowest (0.54%) in first leaf from the inflorescence. The leaf K content was highest (0.57%) in flowering phase and lowest (0.14%) in flushing phase. Bhaskar (1993) [14] reported the occurrence of highest leaf K content at early flowering phase and lowest at fruiting phase.

Conclusion

By considering the higher yield of cashew nut, protein and oil content, NPK and micro-nutrient (*i.e.* Fe, Mn, Cu, Zn and B) content in leaf at different growth stages of cashew (*i.e.* at new emergence shoot stage, flowering stage, nut setting stage and at harvest) and availability of nutrients in the soil, application 1.0:0.50:0.50 kg NPK per tree along with spraying of foliar application of boron though borax @ 0.25% + zinc through zinc sulphate @ 0.5% found to be beneficial in lateritic soils of Konkan.

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