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Mineral composition of selected jackfruit genotypes

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Abstract
The mineral composition of 50 different selected jackfruit genotypes was estimated in college of horticulture, Bengaluru in 2018. The minerals such as potassium, calcium, magnesium, copper, iron, manganese and zinc were estimated using standard procedures. The potassium content was maximum in MDS-1 (332.33 mg 100 g^{-1}) and minimum in HGJ-1 (231.43 mg 100 g^{-1}). The calcium content was maximum in MDS-1 (47.95 mg 100 g^{-1}) and minimum in MYK-1 (28.04 mg 100 g^{-1}). The magnesium content varied from 12.83 mg 100 g^{-1} in HGN-1 to 22.03 mg 100 g^{-1} in HSK-21. The copper content ranged from 0.21 mg 100 g^{-1} in MAM-1 to 0.45 mg 100 g^{-1} in BKV-1. The iron content varied from 2.28 mg 100 g^{-1}in MCR-1 to 4.23 mg 100 g^{-1} in MAK-1. The manganese content ranged from 0.44 mg 100 g^{-1} in MAM-1 to 0.92 mg 100 g^{-1} in BKV-1. The zinc content ranged from0.32 mg 100 g^{-1} in MAM-2 to 1.62 mg 100 g^{-1} in HGP-1.

Keywords: Mineral composition, jackfruit, genotypes, horticulture

Introduction
Jackfruit (*Artocarpus heterophyllus* Lam.) belongs to the family Moraceae and order Rosales. It is believed to have originated in the South Western rain forests of India (Naik, 1949) [6] and has been introduced and cultivated in many tropical countries. Besides India, jackfruit is commonly grown in many parts of Southeast Asia (Rahman *et al.*, 1999) [7], in the evergreen forest zone of West Africa, in northern Australia (Azad *et al.,* 2007) [2], and in south Florida as well (Schnell *et al.,* 2001) [10]. In India, it has wide distribution in both South and North Eastern parts. South Indian states of Kerala, Karnataka, Andhra Pradesh, Tamil Nadu; in Eastern parts of India, Assam, Tripura; Northern parts of India, Bihar, Uttar Pradesh and the foot hills of Himalaya are the important pockets of jackfruit growing regions. Jackfruit tree is a multipurpose species providing food, timber, fuel, and fodder, medicinal and industrial products. The trees have a significant role in the preservation of the environment, very effective in the amelioration of soils and prevention of soil erosion (Reddy *et al*., 2004) [8]. It is hardly recognized as a commercial fruit crop even though it is widely grown in Southern and Eastern parts of India due to wide variation in fruit quality as well as long gestation period of plants raised from seeds. The trees are rarely grown in an orchard or plantation scale but is grown as homestead crop, a shade tree in coffee, arecanut, pepper and cardamom plantations and also as an avenue tree along roadsides. Jackfruit is cross pollinated and the trees that develop from the out-crossed seeds create high level of diversity. As a result, large number of genotypes has been evolved naturally. These genotypes vary for the mineral composition of the fruit pulp. In the present experiment, the mineral composition of the different jackfruit genotypes were estimated using the standard procedures.

Material and Methods
The survey was conducted during the years 2017-18 and 2018-19 to identify the elite promising genotypes of jackfruit in the districts of Mysuru, Hassan, Chickamagaluru, Kodagu, Dhakshina Kannada, Shivamogga, Tumkur and Bengaluru Urban districts of Karnataka. Over 150 genotypes were selected from the survey among which 50 promising genotypes were shortlisted based on the elite characters and the organoleptic scores given by the sensory evaluators. The mineral composition of 50 different selected jackfruit genotypes was estimated in college of horticulture, Bengaluru in 2018.

Determination of mineral content in jackfruit by di-acid method

Digestion of sample

The di-acid digestion was used for determination of Ca, K, Mg, Cu, Fe, Mn and Zn. It was carried out using a 9:4 mixture of Nitric acid and Per chloric acid. 1 g of jackfruit pulp was placed in 100 mL conical flask and 10 ml of HNO_3 and left overnight. Then, 10 mL of di-acid mixture was added and mixed by swirling. The flask was placed on low heat on hot plate in a digestion chamber. Then, the flask was heated at higher temperature until the production of red NO_2 fumes ceased, digestion was continued until the volume was reduced to about 3 to 5 mL but not to dryness. The completion of digestion was confirmed by the snow white residue or when the liquid became colourless. The potassium content was estimated using the flame photometer. Calcium and magnesium were estimated using EDTA and EBT indicator. Micronutrients were estimated by directly feeding the filtered Di or tri acid extract of the plant sample to a calibrated atomic absorption spectrophotometer using respective hollow cathode lamps for each element (Fe, Zn, Mn and Cu). In the present study, each genotype was considered as a treatment. Two fruits from a tree were collected and each fruit was considered as a replication (50 treatments and 2 replications). The pulp was extracted and sored at -20 ºC and used for the estimation of the minerals. The mineral content was significantly different among the 50 selected jackfruit genotypes (Table 1). The potassium content was maximum in MDS-1 (332.33 mg 100 g^{-1}) and minimum in HGJ-1 (231.43 mg 100 g^{-1}). The calcium content was maximum in MDS-1 (47.95 mg 100 g^{-1}) and minimum in MYK-1 (28.04 mg 100 g^{-1}). The magnesium content varied from 12.83 mg 100 g^{-1} in HGN-1 to 22.03 mg 100 g^{-1} in HSK-21. The copper content ranged from 0.21 mg 100 g^{-1} in MAM-1 to 0.45 mg 100 g^{-1} in BKV-1. The iron content varied from 2.28 mg 100 g^{-1}in MCR-1 to 4.23 mg 100 g^{-1} in MAK-1. The manganese content ranged from 0.44 mg 100 g^{-1} in MAM-1 to 0.92 mg 100 g^{-1} in BKV-1. The zinc content ranged from 0.32 mg 100 g^{-1} in MAM-2 to 1.62 mg 100 g^{-1} in HGP-1. Amadi *et al.* (2018) [1] reported 30 mg of calcium, 330 mg of potasium, 11.75 mg of manganese, 21.50 mg of iron and 5.20 mg of zinc in 100 g of the ripe pulp in jackfruit. Shyamalamma *et al.* (2016) [12] have studied the mineral composition of jackfruit and reported that the potassium content was higher (326.47 mg/100g) in dark yellow colour pulp followed by red colour pulp (322.70 mg/100g) and orange colour pulp (216.07 g/100g). Samaddar (2015) [9] has recorded 287-323 mg of potassium and 30.0-73.2 mg of calcium for every 100 g of pulp of ripe jackfruits. Tiwari and Vidyarthi (2015) [14] reported 28.4 to 31.28 mg calcium, 36.52 to 37.8 mg of magnesium, 0.26 to 0.38 mg of copper, 1.20 to 4.24 mg of iron and0.54 to 0.56 mg of manganese in 100 g of jackfruit pulp. Potassium in the jackfruit is found to help in lowering blood pressure and reversing the effects of sodium that causes a rise in blood pressure, which affects the heart and blood vessels (Fernando *et al*., 1991) [4]. Potassium in a human body are important in regulating the various types of body processes, such as acid-base balance, maintenance of osmotic pressure, nerve conduction, muscle contraction and control of heart beat (Deb, 1998) [3]. Calcium is crucial in development of bones and teeth especial in children (Shi *et al*., 2003) [11]. The magnesium content in jackfruit pulp which absorption of calcium and works with calcium to help strengthen the bones and prevents bone-related disorders such as osteoporosis (Gunasena *et al.*, 1996) [5]. The iron content helps to prevent anemia and also helps in proper blood circulation (Singh *et al*., 1991) [4]. Copper (10.45 mg/kg) plays an important. Role in thyroid gland metabolism, especially in hormone production and absorption and jackfruit is loaded with these important micro minerals (Gunasena *et al*., 1996) [5]. The health benefits of Zinc include proper functioning of immune system, digestion, control of diabetes, improves stress level, energy metabolism, acne and wounds healing (Vinson *et al*., 2003). Iron directly helps treating anaemia as it is used in the formation of red pigment called haemoglobin in red blood.

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