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Use of Potassium Nitrate (KNO_3) for Healthy Crops

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SUMMARY

Potassium (K) is well recognized as the essential plant nutrient with strongest influence on many quality parameters of fruits and vegetables. Although Potassium is not a constituent of any functional molecules or plant structures. It is involved in numerous biochemical and physiochemical processes vital to plant growth, yield and quality. Adequate Potassium nutrition has been associated with increased yields, fruit size, increased soluble solids and improved fruit colour, increase shelf life and shipping quality of many horticultural crops. Foliar fertilization of potassium nitrate (KNO3) is a widely used practices to correct nutritional deficiencies in plants caused by improper supply of nutrients to roots. The inadequacy of potassium nitrate is one of the most striking factors that regulate the size of fruit. Potassium is important in formation and functioning of proteins, fats, carbohydrates, chlorophyll and also in maintaining the balance of salt and water in plant cells. Fruit crops such as Mango, Banana, Papaya, Guava, Citrus, Pomegranate, etc. are utmost important nowadays in our life. In fruit crops late flowering, broader flowering span, poor fruit set, poor fruit retention and inferior quality is major problem for fruit growers. To overcome these problems improvement in agronomical practices, selection of proper nutrition like foliar application of Potassium nitrate (KNO3) can be pragmatic.

INTRODUCTION

Potassium (K) is an essential nutrient that affects most of the biochemical and physiological processes that influence plant growth and metabolism. It also contributes to the survival of plants exposed to various biotic and abiotic stresses. Foliar fertilization is more economical than root fertilization due to the higher degree of applied nutrients more efficientlly. Such foliar applications could be used to avoid the depletion of these nutrients in the leaves and the resulting reduction in photosynthetic rate during this period due to poor nutrient uptake from the soil and translocation of these elements from the leaves to the developing seeds.

Potassium (K) plays a key role for increasing the fruit quality because it stimulates about 80 different enzymes, enhances the activity of stomatal aperture, supports the roots strengthening in vegetative growth, and also improves the water potential during the water stress conditions through water absorption for increasing the osmotic potential. Potassium is considered as macronutrient in plant growth and sustainable crop yield and important fertilizer for increasing the crop yield. It sustains turgor pressure of cell which is important for cell enlargement. It helps in osmo-regulation of plant cell, supports in stomatal activity. It is important for the activity of about 60 enzymes. Presently, Weathering process in soil cause the addition of secondary minerals e.g. Ca, Mg, S and also sulphates, carbamates and phosphates. Consequently, these minerals may affect theavailability of K to growing plants.

Presently, increase in cropping intensity, straw removal from the field, excessive usages of tube well water and introduction of high yielding hybrid varieties have resulted in considerable exhaust of soil K. The above-mentioned problems of K availability compel to explore some ways to improve the K use efficiency. One such technique is to apply K fertilizer on the leaves of crop plants. Potassium fixation problem can be reduced by K foliar application techniques. Foliar potassium is more target oriented, timely available to crop plants and inexpensive technique for increasing the fertilizer use efficiency and grain yield over soil application.

Role of Potassium Nitrate (KNO_3) and Its Effect on Different Fruit Crops

Mango

Success has been achieved in stimulating mango flowering with chemical treatments. Likely, application of KNO_3asfoliar feeding to Alphonso mango trees substantially improved TSS, total sugars and sugar/acid ratio over the control. It was observed that with application of KNO3 increased in specific leaf

area, chlorophyll content, stomata conductance, net photosynthesis, leaf nitrogen percentage and soluble protein content in mango. KNO3 1% favoured for higher activities of enzymes such as catalase (CAT), peroxidase (POX) and Nitrate reductase aiding in abiotic stress tolerance and enhanced fruit yield in mango (Vijayalakshmi *et al*, 2000). Application of KNO_3 – 1% and KNO_3 – 3% applied in first fortnight of February enhanced the shoot growth, fruit set and fruit yield over the control. Significantly the highest fruit set was recorded with KNO_3– 3% in mango Cv. Dashehari respectively (Singh *et al*, 2005). Muhammad *et al*. (2007) studied that KNO_3 spray at last week of January before blooming result indicated that KNO_3 3% were found favourable to induce early emergence of panicles, increase panicle length percentage of hermaphrodite flowers and fruit set in mango. Kumar *et al*. (2004) potassium nitrate showed significant effect on flowering and yield of mango. That minimum day required for panicle emergence and flowering, maximum no. of hermaphrodite flowers and maximum no. of fruits per panicle. Burondkar (2005) observed that KNO_3 1% gives maximum results with reducing sugar, total sugar and colour in mango cv. Alphonso. (KNO_3 1% foliar spray at full bloom, marble and egg stages). Patolia *et al*. (2017) reported that KNO_3 2% sprayed twice, first fortnight of October and then November gave maximum number of fruits/tree, maximum fruit weight, higher yield, maximum TSS, maximum total sugar, non reducing sugar, reducing sugar and fruit firmness in Dashehari mango.

Banana

Nutritionally, the banana has a fast growing period, produces high quantity of vegetative biomass, andrequires high amount of nutrients In macronutrients, potassium (K) and nitrogen (N) are the most absorbed in the vegetative as well as in the reproductive periods. In the plants, the K is necessary for the osmo-regulation, opening and closing of the stomata, transpiration, and photosynthesis. Yalve (2008) indicate that foliar spray of KNO_3 recorded minimum days for harvesting and highest bunch weight, no. of fruits/bunch and also increase the shelf life in banana as compared to other treatments. Swati *et al*. (2017) observed that in banana cv. Grand Naine KNO_3 1% 1st spray after complete emergence of bunch and second after 15 days of first spray increased in organoleptic parameters like colour, flavour, test and texture.

Guava

It was observed that the foliar feeding of KNO_3 at higher concentrations tended to exhibit better growth, yield and quality of guava fruits. Manju (2016) reported that KNO3 3% single spray at July along with1 pair leaf pruning observed highest no. of flowers, minimum days to opening of flowers, highest fruit set, yield, highest fruit weight and maximum fruit length in guava cv. Alahabad safeda. Sanjay (2015) evaluated that no. of flowers/shoot and fruit retention per shoot highest with application of KNO_3 1.5% Spraying before flowering, at flowering and after flowering at 15 days interval in guava cv. L-49.

Citrus

Citrus fruit is known as a rich source of dietary fibre and nutrients. It shows that foliar application of K during reproductive stage of the crop is beneficial for improving fruit yield and yield parameters. Vijay *et al*. (2016) studied that KNO_3 @ 2% found maximum juice content and KNO_3 4% along with two sprays in the last week of April and August obtained highest yield in sweet orange cv. Jaffa. Mostafa and Saleh (2006) observed that girdling + 2% KNO_3 two spray 1st at beginning of April and 2nd at mid June gave maximum yield/tree, number of fruits per tree , maximum total carbohydrate content and total chlorophyll content in Balady mandarin. Foliar application of KNO_3 at lower dose (2 %) was found significantly inferior in enhancing fruit yield.

Pomegranate

Foliar spray of KNO_3 significantly influences fruit quality of pomegranate when fruit are in the beginning stages of growth and development. Thirupathi and Ghosh (2015) observed that spraying of KNO_3 interaction with different varieties of pomegranate in Bassein seedless increased no. of fruits per plant, maximum total juice content, highest yield and Jyothi observed highest average fruit weight.

Papaya

Papaya takes up K continuously throughout the entire plant cycle. It is especially important to produce larger and better quality fruits with elevated levels of sugars. Padma *et al.* (2013) found that KNO_3 @ 2% along with 24 hr duration gave maximum germination per cent in papaya seed. Veerannah and Selvaraj, (1984) studied that uptake of K at different stages in papaya (CO-1) of growth including flowering fruiting and harvesting the need was found different but at harvesting and fruit development stage its requirement is higher.

CONCLUSION

Foliar feeding of Potassium nitrate (KNO_3) is one of a great significance for plants because it includes low cost and quick response to the plants. Moreover, foliar application of potassium nitrate (KNO_3) was found to be economical in terms of net benefit, benefit cost ratio and comparatively gives better revenue in terms of higher foliar rates as compared to soil application. It is more helpful to improve the fruit quality by increasing fruit firmness, the total sweetness.

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