

# POTASSIUM & CROP QUALITY



**INTERNATIONAL POTASH INSTITUTE**

[www.ipipotash.org](http://www.ipipotash.org)

## Potassium - A quality nutrient

Ensures optimum quality of the agricultural produce

Potassium (K) is involved in many physiological processes which affect crop quality : activates more than 60 enzymes systems, aids in photosynthesis, favors high energy status, regulates opening of leaf stomata, maintains cell turgor, promotes water uptake, regulates nutrient translocation, favors carbohydrates transport and enhances protein and starch synthesis.

### Quality components of agricultural produce

Class of attribute	Quality attribute	Measurement of quality attribute	K effect
<b>External</b>	Appearance (sight)	Size, shape, gloss, color	Improves appearance attributes
	Feel (touch)	Firmness, texture, peel thickness	Improves feel attributes
	Defects	Cracks, creases, marks, flaws (caused by physiological disorders, pests and diseases)	Reduces defects
<b>Internal</b>	Taste	Sweetness, bitterness, sourness, saltiness, juice content	Improves taste attributes
	Texture	Tenderness, firmness, crispness, crunchiness, chewiness, fibrousness	Improves texture attributes
<b>Hidden</b>	Nutritional value	Content of sugars, proteins, starch, vitamins, soluble solids, minerals	Improves nutritive value
	Storage & shelf life (produce deterioration spoilage & post-harvest losses)	Water loss and decay, discoloration, bruising and other mechanical injury, wilting, texture changes	Improves storage and shelf life
	Processing quality		Improves processing quality

## Potassium and food appearance

Potassium ensures uniform and large size, good shape, attractive colour and absence of blemishes, markings, mechanical injuries and signs of diseases.

### Effect of K application on appearance of field crops

Adequate K supply promotes the formation of larger grains due to intensive and longer periods of photosynthesis.

Grains of K treated crops get a bonus price due to better appearance owing to improved boldness and increased seed shining.



SUNFLOWER  
IPI-PAU. 2006

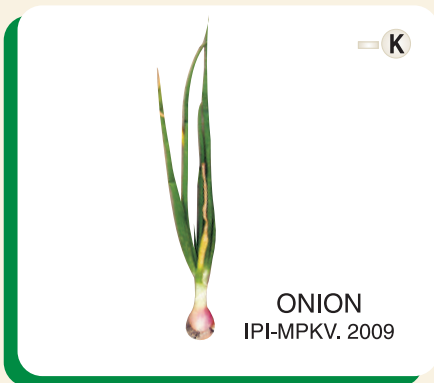
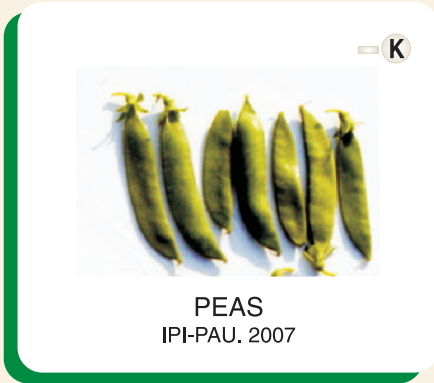
MAIZE  
IPI-PAU. 2005

WHEAT  
IPI-JNKVV. 2003

## Effect of K application on appearance of vegetables

Vegetables with attractive size and shape fetches better price and farmers gain additional income and profit.

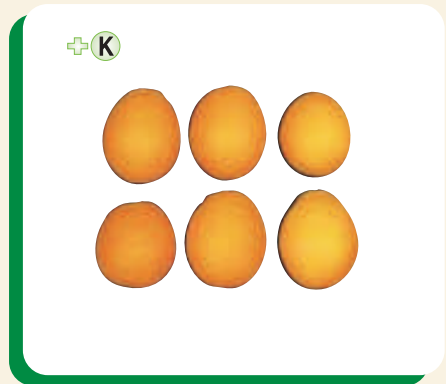
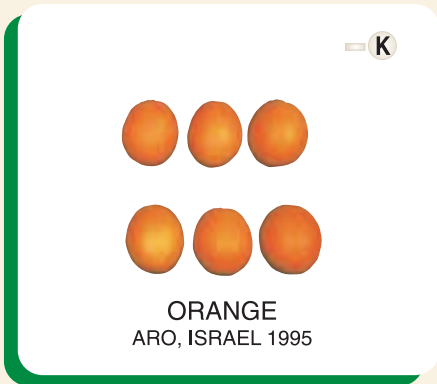
Potassium application increases the yield of large and medium sized pea pods, onion bulbs and potatoes tubers.



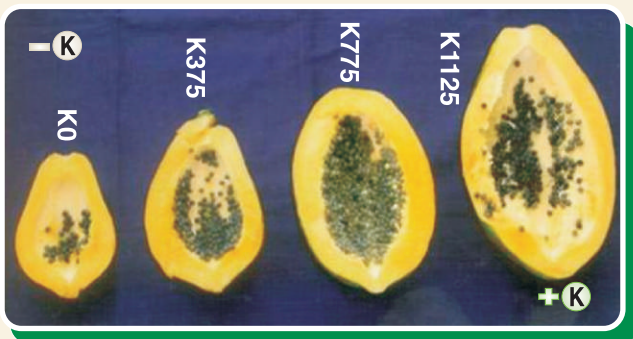
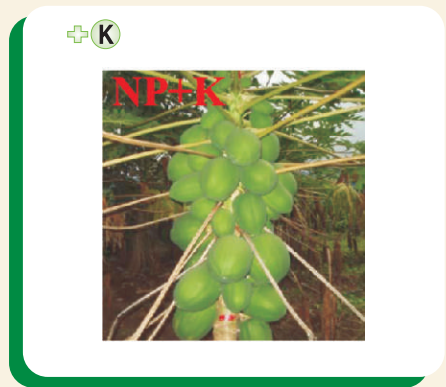
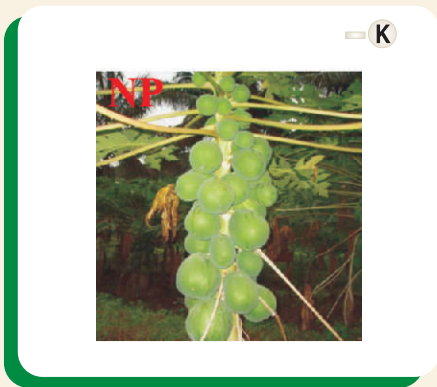
POTATO  
IPI-PRII-CPRI. 1998

## Effect of K application on appearance of fruit

In citrus, physiological disorder like plugging and creasing are associated with high N and low K supply. Potassium deficiency results in small, thin-skinned fruit and promotes fruit splitting. Potassium application improves the shape, size and colour of the citrus fruits.



Potassium application increases the size of papaya fruits thus making them more attractive to fetch higher prices and higher profit.



PAPAYA  
IPI-TNAU. 2004

## Potassium and processing quality

**Cotton:** potassium increases boll size, micronaire, fibre strength, fibre length and increases percentage of mature fibres.

**Wheat:** potassium improves the baking quality by favouring the synthesis of gluten and prolamine as well as formation of protein.

**Potato:** potassium application enhances the quality of potato for processing. Potassium deficiency causes accumulation of reducing sugars, thus producing undesirable dark coloured chips. Internal blackening of potato tubers may be related to an excess of tyrosine caused by K deficiency. Evidence exists that bruising and hollow heart can be reduced by K application.

## Potassium and nutritional value

Application of K increased the oil content in groundnut by 1-2 % resulting in substantial increase in oil yield from 800 to 1000 kg ha<sup>-1</sup> (Fig.1).

Similarly the oil yield of sunflower increased from 575 to 800 kg ha<sup>-1</sup> with increase in levels of applied K (Fig. 2).

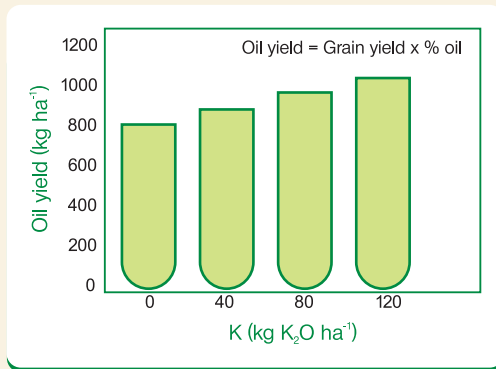


Fig.1 Effect of K application on oil yield of groundnut. IPI-PRII-GAU. 1999

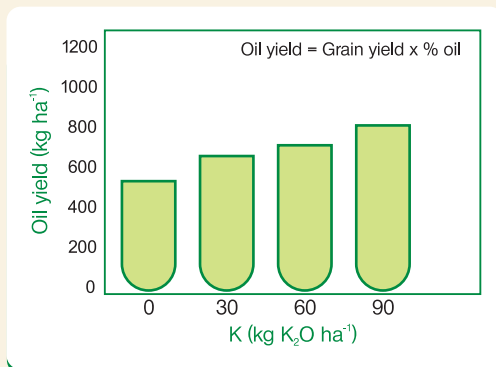


Fig. 2 Effect of K application on oil yield of sunflower. IPI-PAU. 2007

Potassium application increased grain protein content of pearl millet from 9.9 to 11.6% and protein yield from 250 to 340 kg ha<sup>-1</sup>. In mustard the protein content was increased from 18.9 to 20.1% with a corresponding increase in protein yield from 320 to 370 kg ha<sup>-1</sup> (Fig. 3).

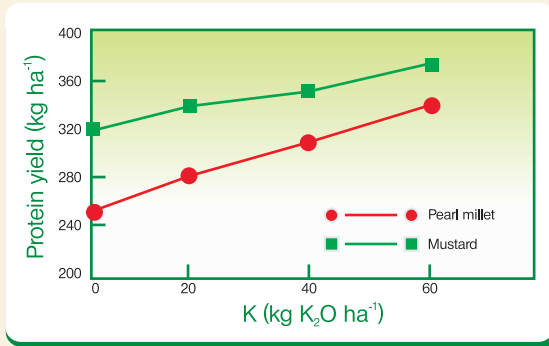


Fig. 3 Effect of K application on protein yield of pearl millet and mustard. IPI-HAU, 2007

Potassium application increased the vitamin C (ascorbic acid) and carotenoid content in mango (Fig. 4).

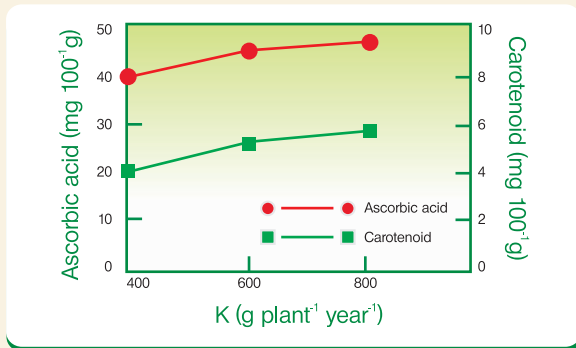


Fig. 4 Effect of K application on ascorbic acid and carotenoid content in mango (Siva Kumar, 2007)

Studies from BCKV, West Bengal showed that increased levels of K application not only increased the fruit weight but also the total sugar content in various fruits (Table 1).

Table 1. Effect of K application on fruit weight and total sugar (Mitra 2009)

Fruit Crop	Increase in applied K (g plant <sup>-1</sup> yr <sup>-1</sup> )	Increase in fruit weight (%)	Increase in total sugar (%)
Banana	120 → 240	18.8	14.4
Litchi	200 → 600	13.8	13.7
Guava	130 → 260	15.8	14.3
Mandarine	200 → 600	27.4	18.1
Pineapple	200 → 600**	35.7	18.7
Papaya	200 → 600** ** kg ha <sup>-1</sup>	15.3	34.1

Potassium application improved the nutritional quality of papaya by increasing pulp thickness and total soluble solids (TSS) while decreasing acidity.

Table 2. Effect of K application on fruit quality of papaya (IPI-TNAU, 2007)

Treatment	Pulp thickness (cm)	TSS°(Brix)	Acidity (%)
K <sub>0</sub>	2.21	10.81	0.65
K <sub>150</sub>	2.48	11.57	0.52
K <sub>300</sub>	2.59	11.87	0.47
K <sub>450</sub>	2.60	12.50	0.33

### Potassium and shelf life

Potassium improves shelf life by slowing senescence and decreasing physiological disorders. Potassium increases firmness and strength of fruit skin. It decreases the post harvest loss of moisture by maintaining tissue integrity.

The shelf life of mango was increased with increase in levels of potassium application (Fig. 5).

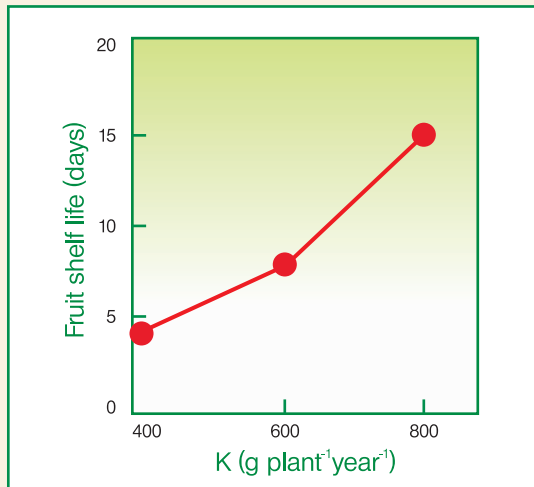


Fig. 5 Effect of K application on shelf life of mango. IPI - TNAU, 2007



**INTERNATIONAL POTASH INSTITUTE**

P. O. Box 569, CH-8810, Horgen, Switzerland

E-mail: [ipi@ipipotash.org](mailto:ipi@ipipotash.org)