POTASH FERTILIZERS:

TOWARDS HIGHER YIELDS OF
COTTON
AND BETTER FIBRE QUALITY

INTERNATIONAL POTASH INSTITUTE
Optimizing Crop Nutrition
www.ipipotash.org

Importance of potassium in cotton production

Potassium is an extremely important nutrient for cotton because its application:

- Increases cotton productivity by increasing number, size and weight of bolls
- Improves fiber quality properties (length, strength and micronaire)
- Increases water use efficiency and thus plant resistance to drought conditions

- Reduces the incidence and severity of pest and disease attacks

Nutrient removal by cotton

Average nutrient removal from the soil per 1.0 tonne seed cotton is expressed as (kg/ha):

	N	P_2O_5	K_2O
Lint & seeds	24	10	12
Stems & leaves	22	6	28
TOTAL	**46**	**16**	**40**

The total removal of potassium reaches up to 100 kg K_2O/ha with the high yield level up to 2.5 t/ha seed cotton.

New higher-yielding earlier-maturing cotton varieties develop more of their total boll load over a shorter period of time, thus resulting in increased demand for the uptake of K from the soil. The daily uptake of K by cotton may be as high as 5 kg K_2O/ha at the peek stage of K uptake, i.e. during mid-bloom.

Without potash fertilizer, soil can not maintain sufficient concentration of K in soil solution to meet high K uptake of modern high-yielding short duration cotton varieties.

Potassium deficiency symptoms

Potassium deficiency in cotton is mostly observed when root growth is reduced after flowering and the rapidly developing boll load serves as the dominant sink for plant K. K deficiency symptoms show up at the bottom of the plant on the lower, older leaves but for modern high-yielding varieties the symptoms may occur at the top of the plant late in the season.

K deficiency symptoms
(healthy leaf in the center)

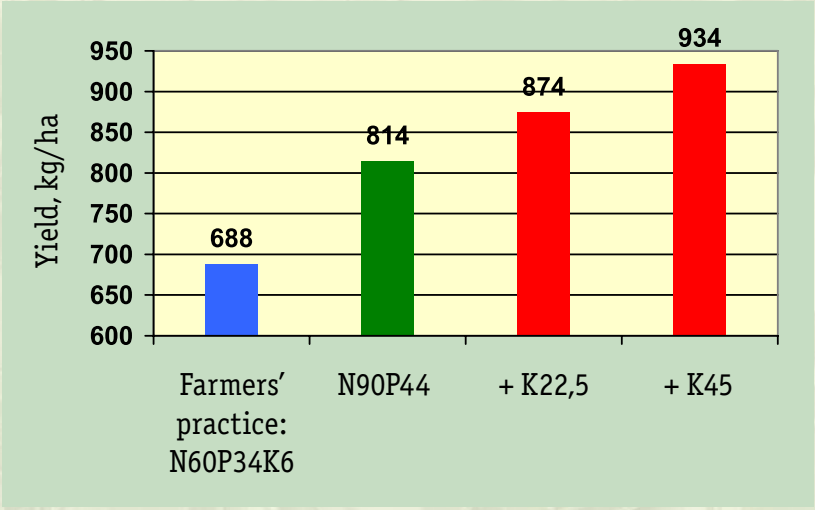
With K deficiency, yellowish-white mottling changes leaf color to light yellowish-green. Yellowish spots begin to appear between the veins, then the center of these spots dies and numerous brown specks occur at the leaf tips, around margins and between veins. Tips and margins break down and begin to curl. Leaves become reddish-brown, dry, and finally rust colored and brittle. Leaves are prematurely shed.

With K deficiency, cotton bolls fail to develop properly and may fail to open or only partially open, and the fiber is of poor quality.

Total bolls and open bolls as dependent from potash use
(Nagpur, Maharashtra, 2004)

Efficiency of potash fertilizer use to cotton

On-farm experiments conducted at Nagpur, Maharashtra, showed that seed cotton yield increased up to 22% due to potash fertilizer use in recommended rates. Potash application to modern cotton varieties was efficient even on soils with high content of exchangeable potassium.

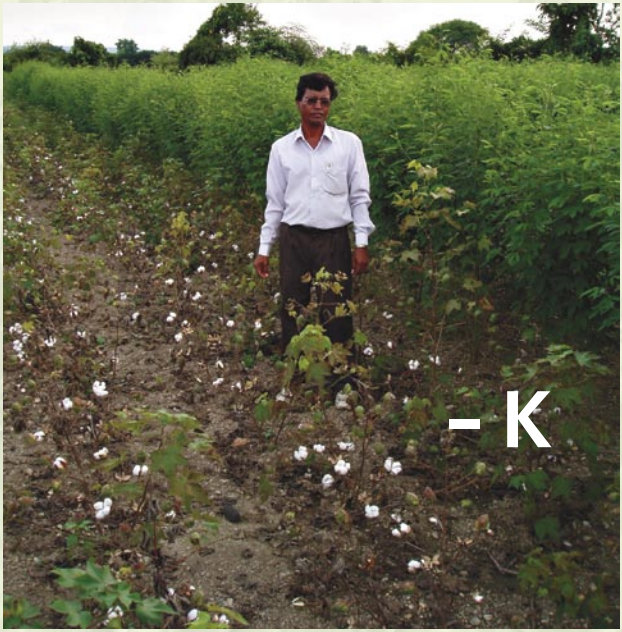


Seed cotton yield as the average of 5 farmers' fields
(Nagpur, Maharashtra, 2005)

Economics of potash application to cotton

The extra profit of farmers due to potash use to cotton is calculated as follows (the average of 5 farmers' fields, Nagpur, Maharashtra, 2005):

K_2O	MOP	Cost of MOP, Rs/ha	Seed cotton yield	Yield increase due to K	Added returns due to K	**Profit due to K**
kg/ha			kg/ha		**Rs/ha**	
-	-	-	814	-	-	**-**
22.5	37.5	200	874	60	2080	**1880**
45	75	400	934	120	3040	**2640**



Response of both cotton and pigeon pea to potash application
(Nagpur, Maharashtra, 2004)

Methods of potash fertilizer application

Potassium requirements of cotton can be met mainly by basal soil application of potash fertilizer. Soil K as measured by a soil test needs to be maintained at a high level in order to assure an adequate supply of K during a later period of cotton development when K uptake from the soil is the highest.

In some cases, split application of potash fertilizer ($^1/_2$ basal + $^1/_2$ early boll formation) can be a good practice on light-textured soils with low clay content in subsoil.

Split application of potash fertilizer may be recommended to be done on soils with high K-fixing capacity. Cotton responds to split application of potash on soils having strong K-fixing capacity even when soil K tests show high range of K content.

Importantly to note that modern high-yielding short duration cotton varieties have higher demand in nutrients as compared with traditional low-yielding long duration varieties.

Average CICR* fertilizer recommendations in cotton–pigeon pea cropping system for Nagpur and neighbouring districts (kg/ha)

Varieties/hybrids	Cotton			Pigeon pea		
	N	P_2O_5	**K_2O**	N	P_2O_5	**K_2O**
Traditional	60	30	**30**	20	45	**45**
High yielding	90	45	**45**			

* Central Institute for Cotton Research, Nagpur, Maharashtra

45 kg K_2O/ha = 18 kg K_2O/acre = 75 kg MOP/ha = 30 kg MOP/acre

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