

Spotlight on Agriculture

Ministry of Agriculture, Water and Rural Development • Directorate of Agricultural Research and Training • Private Bag 13184 • Windhoek

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Management of Inorganic Fertilizers for Cotton

Crop growth and yields are often restricted by inadequate nutrients in the soil. Fertilizer is a source of plant food providing up to 13 elements that are important for plant growth. Nitrogen, Phosphorous and Potassium are often the principal deficiencies in cotton production. The need for fertilizer and the amount to be added to crops depends mainly on the fertility status of the soil. Fertilizer is an important input that increases production, however it is expensive and thus it must be used correctly and efficiently. The same amount of fertilizer if properly applied will produce better harvest and higher income.

IDENTIFICATION OF NUTRIENT DEFICIENCIES IN COTTON

If the soil is deficient in one or other nutrient, cotton will show deficiency symptoms, which can be identified visually. This visual method does not require expensive or complicated equipment and can be used to supplement other diagnostic techniques.

Nutrient deficiency symptoms may be caused and modified by diseases or insects. It requires therefore trained and skilled personnel to distinguish these differences.

Nitrogen deficiency: The symptoms of Nitrogen deficiencies are:

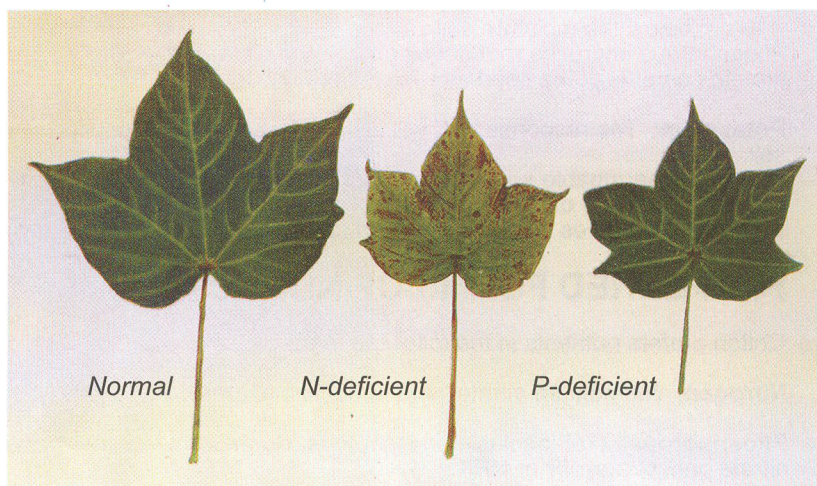
- Visible light green leaves.
- Lower leaves turn yellowish followed by the drying to brownish colour.

Nitrogen deficiency in the soil can give very serious problems, especially during the early stages before the plant establishes an extensive root system.

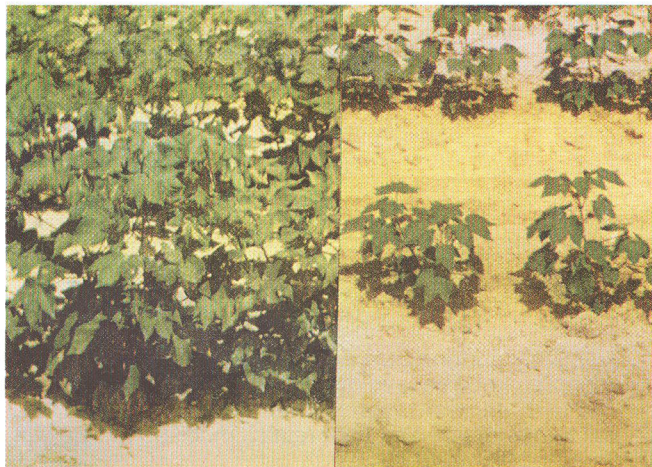
Phosphorous deficiency: The following are common symptoms of phosphorous deficiency in cotton:

- The typical purpling of the leaves.
- Plants are short and small.
- Growth is retarded and maturity is postponed.

Studies indicate that cotton does not react very well to phosphorous fertilizers. Hence, phosphorous fertilizer should only be applied for the preservation of soil fertility to replace the phosphorous that is removed by the plant.



Plants showing Nitrogen-deficiency on the left, with normal plants on the right.



Normal plants on the left, with plants showing Phosphorous-deficiency on the right.

Potassium deficiency: The typical symptoms are:

- Bronzing and marginal necrosis of leaves adjacent to developing bolls.
- The plants develop fully necrotic leaves and defoliate prematurely.
- The plants show chlorosis along the leaf margins followed by scorching and browning of the whole leaf.
- Low potassium content plants are susceptible to stem blight leading to premature leaves.

It is important to not only keep in mind the quantity of extractable potassium relative to the cations in the soil.

Do not apply potassium when the soils have the concentrations of higher than 80 – 100 and 120 mg K kg⁻¹ (ppm) respectively for sand loam and clay soils.

FERTILIZER RECOMMENDATIONS

Due to the extensive variability in the Namibia's soils it is very difficult to come up with generalized or blanket recommendations for cotton fertility management.

Nitrogen: The response to nitrogen is better on irrigated than in rain fed cotton. Nitrogen increase plant height, boll bearing capacity and seed weight. It improves seed cotton yield. Excess Nitrogen results in rank growth, poor fruiting, delayed maturity and difficult defoliation and boll rot. Nitrogen given before or at planting can be broadcast together with Phosphorous and Potassium and incorporated into the soil, but placement at a depth of 5cm below and 5 cm away from the plant is recommended rather than broadcasting.

To obtain the highest efficiency from Nitrogen, one half or one third must be given at a time of sowing and the remainder split between:

- Square formation and peak flowering.
- Boll development.

Split applications will better meet the crop requirement and as well as replacing the nitrogen that has leached. For an optimal nutrient response, weed, insect and disease control is essential.

Phosphorous: The response of cotton to P and K is normally better if it given in the form of NPK fertilizer mixture like 2:3:2 (22%) or 2:3:2 (30%). It should be applied before or at planting by incorporation into the soil with placement 7.5 – 10 cm below the moisture soil surface.

Phosphorous improves root development and water use efficiency, the energy balance and the weight and the oil and protein contents of the seed as well as fibre quality.

Potassium: The response to K will always be better if it is applied with N and P pre-planting and incorporated into the soil.

On sandy, permeable soils it is appropriate to give a split application of K for example with a second dressing being applied at the time of thinning.

Potassium improves fibre fineness and strength and it facilitates early maturity of the crop.

PREFERRED FORMS OF NUTRIENTS

Cotton prefers nutrients in the following forms:

Nitrogen: Ammonium nitrate; Ammonia sulphate; Urea; NP or NPK containing Nitrogen in ammonium nitrate form.

Phosphorous: Water-soluble phosphorous; nitrate soluble form – super phosphate; Ammonium phosphate; Ammonium nitrate phosphate; NP or NPK.

Potassium: Normally as potassium chloride in NPK fertilizer; when sulphur is lacking as potassium sulphate.

General recommended fertilizer practices: Assuming the continuing availability of subsidized fertilizer, farmers should be advised to apply the following fertilizers. This recommendation represents the minimum that is thought to be profitable under dry land conditions in Namibia. **Basal:** 2:3:2 (30%) or 2:3:2 (22%) = 100 kg per hectare.

Top dressing at first flowering: Urea = 50 kg per hectare.

If there are good early rains a farmer willing to take the risk may be advised to double the basal fertilizer rate to 200 kg/ha. If crop establishment is good and the season looks promising a farmer willing to take the risk may be advised to double the top dressing of urea to 100kg/ha.

If the early rains are poor and planting is delayed, farmers may decide that because of the risk of a poor crop he should limit the amount of basal fertilizer applied. Likewise, she or he may use a lower seed rate. Later, the amount of urea applied as top dressing will depend on the number of strong flowering plants. A farmer should be advised to apply about half to one coca cola bottle cap of urea per plant.

Relatively performance with various rates of fertilizer inputs is high where less fertilizer was applied. Negative effects appeared to be caused by low rainfall, high soil temperatures, imbalance of soil fertility and poor management practices. The NPK mineralization is directly related to the low decomposition of the inorganic matter. It is concluded that high soil temperatures and poor rainfall modified the yield of cotton crop.

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