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# Leaf Reddening in Cotton (*Gossypium hirsutum* L.) and Its Management

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## Abstract

**R**eddening of cotton crop foliage is a physiological disorder induced by different abiotic stresses, a major problem in cotton growing regions of the country. This disorder has major effect on normal growth and development of crop. Recently, this has emerged as a serious problem in the various cotton growing areas. In India, leaf reddening was identified long ago but it has spread widely as a major disease only after cultivation of hybrids of BT-cotton. However it's very important to diagnose the problem and manage accordingly to harvest better yields.

## Introduction

**M**ost common phenomena in all cotton growing areas is leaf reddening. Its problem as bronze wilt was identified in 1995 in Mississippi and Louisiana; and in following years in Texas, Arkansas, Tennessee and North Carolina (1996); Georgia and California (1997). This physiological disorder an outcome of the many factors interaction, factor like climatic condition, soil nutrient available status, varietal character and mainly day and night temperature during the crop flowering and boll development period. *Gossypium hirsutum* varieties, inter and intra specific hybrids are vulnerable to this physiological disorder (Edreva *et al.*, 2002; Gade *et al.*, 2013).

This disorder induced by different abiotic stresses. This malady generally observed in soils with low nitrogen supply, imbalanced application of fertilizers, water stress due to poor drainage system in soil sudden reduction in night temperature arresting the translocation and high radiation.

In India, generally cotton grown on a deep black soil or black cotton soil with a pH of 6 to 8.5, it may not be limiting for the availability Ca and Mg in these soils. However, sometimes excess exchangeable Ca may lead to Mg deficiency also. When the Mg content in the leaves at flowering stage, falls below 0.3 percent reddening of leaves is observed (Perumal and Subramanian, 1979).

This malady generally notices in all the crop growth stages, particularly during flowering and boll development stage. However, it is quite often confused with the reddening of leaves caused by sucking pest damage or nutrient deficiency at early crop growth stages.

Crop at grand growth stages, due to leaf reddening hindered the photosynthesis production system, its translocation and distribution to different parts of the plants because of these reasons it increases the leaf reddening effects in cotton. The factors affecting ideal source-sink relationship promote leaf reddening and symptoms are prolific in nature under extreme stress situations.

## Symptoms

Leaf reddening generally observed in the older leaves of plants at early stages and as the crop growth advances it spread to all the plant parts (old and new leaves) (Figure 1). It starts turning yellow at initial stage of the leaf margin and later it turns to purplish red colour on the whole leaves (Figure 2). Later petiole becomes weakened and it prone to shedding. Magnesium deficiency noticed in older leaves and the symptoms appear from leaf margin. Moreover the magnesium deficiency induces purplish red colour.

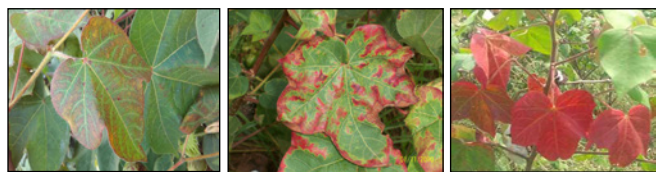


Figure 1: Severity of leaf reddening in cotton during flowering and boll formation stage

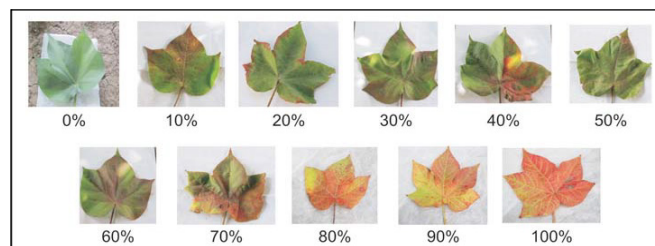


Figure 2: Progress of leaf reddening during the cotton growth period (Source: NCIPM, Technical bulletin 30)

## Causes

The reddening appears in the plants due to various reasons like lowered nitrogen level in the leaves (below the critical limit) due to low availability in the soil, impaired uptake under water deficit and waterlogging conditions, diversion of N to the developing bolls, synchronized boll development and high boll demand, desiccation caused by high wind velocity and abrupt changes or drop in night temperature (below 15 °C). Many researchers indicted that, in cotton leaf which having the low nitrogen and magnesium contents it shows the leaf reddening. It is noticed that, N stressed leaves increase the accumulation of carbohydrates; thereby it may increase the carbon to nitrogen ratio. In due course of time in these leaves dominated the accumulation of anthocyanin concentration. Certain factors such as drought followed by rain or irrigation, sudden change in atmosphere causing excessive evaporation, cloudy weather during the flowering and boll development period and higher solar radiation.

## Management

- Sow the crop (May 2<sup>nd</sup> fortnight or 1<sup>st</sup> fortnight of June) to skip the adverse environmental condition during boll development stage.
- At the time of sowing apply the (basal dose)  $MgSO_4$  @ 10-12 kg/ha.
- Supply the balanced and timely use of fertilizer during flowering and boll development stage particularly in hybrids.
- Avoidance of susceptible cultivars.
- Need based irrigation and have a good drainage system to avoid water-logging in the fields.
- It may show the leaf reddening incidence due to even sucking pests incidence also, may overcome by spraying insecticides.
- Adopt the inter-cultivation and hand weeding at CWC (Critical Weed Competition) period or days.
- Adopt the good crop rotation and synergetic inter-cropping system to maintain the soil fertility.
- Adopt the remedial measures, if damage is more than 10-15 % of the total crop.
- Before the start of winter season apply the  $MgSO_4$  @ 0.5 % in 15 days intervals along with one/ two sprays of urea/DAP/ 19:19:19 @ 1-2 % through foliar application.

## Conclusion

Leaf reddening in cotton is becoming major problem over the years subsequently affecting normal growth and development of crop. Left unmanaged this physiological may pose a serious effect on ultimate yield and even damaging quality of cotton obtained. Therefore it's of prime importance to diagnose the reddening symptoms in the early stages and its causes thereby minimizing the problems associated with it.

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