

Proceedings:

International Conference on
Mango and Date Palm: Culture and Export.
20th to 23rd June, 2005.
Malik *et al.* (Eds), University of Agriculture, Faisalabad.

MANGO MALFORMATION IN RELATION TO LEAF NITROGEN CONTENTS

Raheel Anwar, Muhammad Saleem, Basharat Ali Saleem, Saeed Ahmad and Zahoor Hussain
Institute of Horticultural Sciences, University of Agriculture, Faisalabad-38040, Pakistan.
Email: raheelanwar65@yahoo.com

ABSTRACT

Current study was aimed at exploring relationship between leaf nitrogen content and malformation. Foliar treatments of nitrogen resulted in increased levels of leaf nitrogen along with higher incidence of malformation compared with control. Highest rate of foliar nitrogen application (4%) resulted in maximum malformation intensity (45.43%) and mean leaf nitrogen contents 1.64% compared with 10% malformation intensity and mean leaf nitrogen 1.31% in control.

In 2% urea application, leaf nitrogen level was 1.62% with malformation intensity of 19.43% while 3% low biuret urea application caused increase in leaf nitrogen level i.e. 1.54%. Malformation intensity on tagged flush was 35.64% in this treatment. In 4% low biuret urea spray, leaf nitrogen level was 1.64% along with malformation intensity of 45.43%. The mean number of flushes per branch, number of leaves per flush and size of flush (cm) increased in all the treated trees as compared to control.

Results revealed that foliar application of low-biuret urea increased leaf N level as well as the intensity of malformation. It appears that leaf nitrogen is positively correlated with malformation.

Keywords: Mango, Dusehri, leaf nitrogen, foliar application, malformation.

INTRODUCTION

It is unfortunate that mango is subjected to a large number of disorders right from the plants in the nursery to the fruit in transit and storage, which ultimately results in low yield with poor quality fruit, respectively. The mango industry is particularly facing such challenging problems like alternate bearing, malformation, unreliable fruit setting, poor cropping, insect-pests and diseases which appear mainly due to enigmatic blooming and vegetative growth behaviour (Chacko, 1991). Of these, malformation is most damaging. It is a very serious disorder of mango and a limiting factor in its economic cultivation. In Pakistan estimated annual production loss due to malformation is 16 thousand tonnes. This loss is equivalent to a value of \$ 4.35 million. Mango malformation has been a matter of controversy overtime and is a threatening disorder to the economic viability of mango industry (Khan & Khan, 1958; Verma *et al.*, 1971). All the commercial cultivars suffer from this intricate problem, which appears to be associated with enigmatic blooming and vegetative growth behaviour (Chacko, 1986). Floral malformation is more destructive than vegetative as malformed panicles are unproductive (Chadha and Pal, 1993). Sharma & Badiyala (1990) presented the results of an extensive survey of the incidence of mango

malformation in five cultivars in which cv. Dusehri showed the highest incidence of floral malformation. Insects, viruses, fungi and nutrition are main reasons attributed to the malformation. Parsad et al. (1965) recorded that nutrition plays an important role in reducing the incidence of malformation. Nutritional status of the mango tree is considered as a key factor affecting vegetative growth, flowering and bearing of mango and even malformation. Nutritional imbalance has also been recognized as the cause of malformation and irregular bearing (Jagirdar & Jafri, 1966; Sen, 1943). Ghosh and Chattopadhyay (1999) investigated the effect of foliar application of urea on yield and leaf nitrogen content and concluded that foliar application of urea significantly increased leaf nitrogen contents.

This project was aimed at testing whether leaf nitrogen contents are related to mango malformation.

MATERIALS AND METHODS

The research work was conducted at Experimental Fruit Garden (Square No. 9), Institute of Horticultural Sciences, University of Agriculture, Faisalabad during 2003-04. The laboratory work was conducted in the Pomology Lab of institute.

Experiment was conducted on 10 trees of 10-15 years of age having uniform vigour under same agro-climatic conditions. Low biuret urea at 3 concentrations i.e. 2.0, 3.0 and 4.0% was sprayed onto mango (*Mangifera indica* L.) tree cv. Dusehri five times throughout the year besides recommended dose of fertilizer through soil (2kg NPK/tree). Complete application schedule for all treatments along with their replications is given in Table 1. Ten (10) branches were tagged on individual trees for observations. Single tree was taken as treatment unit with three replicates. Changes in nitrogen contents in the leaves of experimental trees were estimated at various times of the year. Experiment was laid out according to RCBD.

RESULTS AND DISCUSSION

All the panicles whether healthy or malformed which emerged on flushes of treated or untreated (control) trees were counted. The data regarding the malformation intensity was statistically analyzed which showed highly significant results. Treatment means showed that the range of malformation in the treated and untreated trees were from 10 to 45.43% (Table 2). Maximum malformation intensity was in T_3 (45.43%) and minimum percentage was in T_0 (10.0%). From the results, it was clear that malformation has a positive correlation with the nitrogen contents of malformed panicles. It appears from the results that leaf nitrogen level was positively correlated with malformation intensity. The results of this parameter were contrary to the findings of Khan and Khan (1958) who reported that foliar spray of nitrogen at monthly intervals during winter significantly reduced malformation.

All foliar treatments of nitrogen resulted in increased levels of leaf nitrogen along with higher intensity of malformation compared with control (Figure 1). Highest rate of foliar nitrogen application (4%) resulted in maximum malformation (45.43%) and mean leaf nitrogen contents 1.55% compared with 10% malformation and mean leaf nitrogen 1.31% in control.

- In 2% urea application (T_1), leaf nitrogen ranged between 1.36% (April, 03) to 1.89% (July, 03) with mean malformation of 19.43%.
- 3% urea application caused leaf nitrogen of 1.31% (April, 03) to 1.78% (Nov, 03) while malformation intensity on tagged flush was 35.64%.
- In 4% low biuret urea spray, the range of leaf nitrogen was 1.40 % (April, 03) to 1.89% (Aug, Oct. & Dec.03) along with malformation incidence of 45.43%.

On lab analysis of healthy and malformed panicles, it was observed that in malformed panicles nitrogen percentage was higher than that of healthy panicles in all treatments including control (T_0). These results confirmed the findings of Khan & Zaid (2000) who observed severely disturbed carbohydrate and nitrogen metabolism in malformed tissues. Higher nitrogen percentage in malformed panicles than in the healthy ones clearly indicated the possibility of

inadequate utilization of nitrogen or unavailability at the time of flower induction (Table 3). Our results also coincided with the findings of Zora et al. (1991) who found significantly higher nitrogen in malformed panicles. The leaves on shoot bearing malformed panicle also showed the tendency to accumulate nitrogen that was the reason that such leaves show significantly higher level of almost all nutrients compared with leaves on shoots bearing healthy panicles.

The number of flushes per branch, number of leaves per flush and size of flush (Table 3) were increased in all the treated trees as compared to control (Figure 2). Our preliminary results revealed that foliar application of low biuret urea increased leaf nitrogen level as well as the intensity of malformation. Tiwari and Rajput (1975) found that nitrogenous applications enhanced vegetative growth and thus heavy application of nitrogenous fertilizers might inhibit floral initiation by indirectly promoting vegetative growth. In view of these findings, future experiments should be designed to determine the critical level of foliar application of urea for a specific variety and also leaf nitrogen level, before and after foliar application, must be considered so as to tackle malformation.

REFERENCES

- Chacko, E.K. 1986. Physiology of vegetative and reproductive growth in mango (*Mangifera indica* L.) trees. Proc. 1st Aust. Mango Res. Workshop, CSIRO, Melbourne, Australia. p. 54-70.
- Chacko, E.K. 1991. Mango flowering-still an enigma. Acta Horticultuae 291:12-21.
- Chadha, K.L. and Pal, R.N. 1993. The current status of the mango industry in Asia. Indian Council of Agriculture Research, Krishi Bhawan, New Delhi 110001, India.
- Ghosh, S.N. and Chattopadhyay, N. 1999. Effect of urea and NAA on fruit retention and physiochemical composition of mango (*Mangifera indica* L.). Horticultural Journal 12(1):21-26.
- Jagirdar, S.A.P. and Jafri, N.R. 1966. Malformation of inflorescence. Agri. Pak. 17:357.
- Khan, F.A. and Zaid, P.H. 2000. Malformation induced changes in sex ratio and pollen characteristics of mango cultivars. Annuals of Agricultural Research 21(2):234-237.
- Khan, M.D. and Khan, A.H. 1958. Some studies on malformation of mango inflorescences in West Pakistan. Pb. Fr. J. 23:247-258.
- Parsad, A., Singh, H. and Shukla, T.N. 1965. Present status of mango malformation disease. Ind. Hort. 22:254-265.
- Sen, P.K. 1943. The bearing problem of mango and how to control it. Indian J. of Hort. 10:67-71.
- Sharma, I.M. and Badiyala, S.D. 1990. Incidence of mango malformation in different locations of Himachal Pradesh. Indi. J. of Mycology and Plant Pathology 20:179-181.
- Tiwari, J.P. and Rajput, C.B.S. 1975. Effect of urea spray on vegetative growth and fruit weight of different mango cultivars. Bangladesh Hort. 3(1):31-36.
- Verma, A., Dele, V.C., Chaudhari, S.P.R., Ram, A. and Stang, A. 1971. Mango malformation. Proc. Ind. Sci. Acad. 33:291-300.
- Zora, S., Dhillon, B.S. and Arora, C.L. 1991. Nutrient levels in malformed and healthy tissues of mango. Plant and Soil 133(1):9-15.

TABLES

Table 1: Treatment application schedule of experiment

#	Treatments	Replications
1.	T ₀ (Control)	---
2.	T ₁ (2% Low biuret urea)	R ₁ (Jan, April, July, Sep, Nov)
		R ₂ (Feb, May, Aug, Oct, Dec)
		R ₃ (March, June, Aug, Oct, Dec)
3.	T ₂ (3% Low biuret urea)	R ₁ (Jan, April, July, Sep, Nov)
		R ₂ (Feb, May, Aug, Oct, Dec)
		R ₃ (March, June, Aug, Oct, Dec)
4.	T ₃ (4% Low biuret urea)	R ₁ (Jan, April, July, Sep, Nov)
		R ₂ (Feb, May, Aug, Oct, Dec)
		R ₃ (March, June, Aug, Oct, Dec)

Table 2: Comparison of leaf nitrogen level and malformation intensity in mango

Treatment	Leaf nitrogen level (%)	No. of malformed Panicles/branch	Size of malformed panicles (cm)	Malformation intensity (%)
T ₀	1.31	1.0	09.80	10.00
T ₁	1.62	1.4	15.20	19.43
T ₂	1.54	3.9	15.80	35.64
T ₃	1.64	3.5	16.40	45.43

Table 3: Comparison of nitrogen status (%) of malformed and healthy panicles

Treatment	Healthy panicles	Malformed panicles
T ₀	1.53	1.58
T ₁	1.73	1.88
T ₂	1.71	1.73
T ₃	1.90	2.10

FIGURES

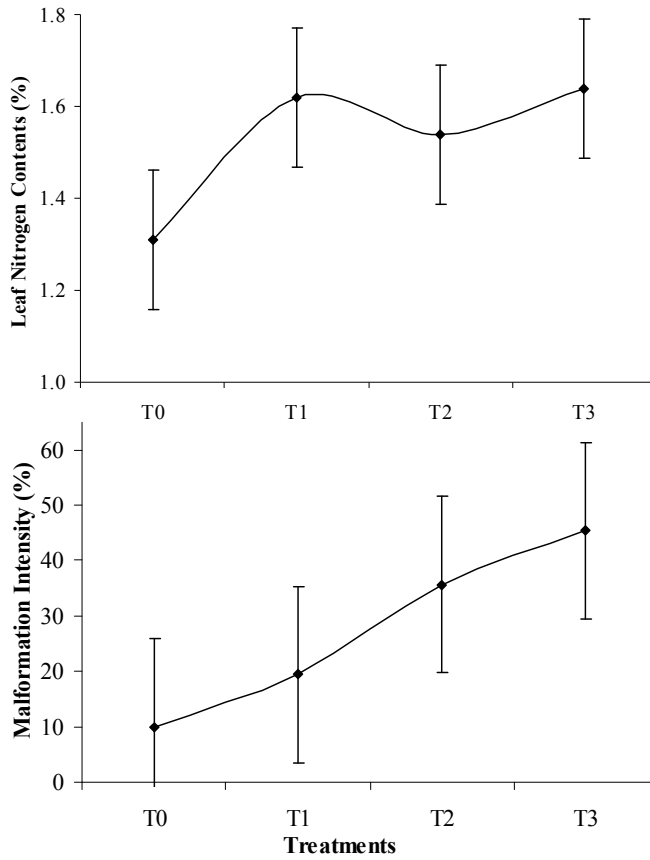


Figure 1: Effects of foliar application of low-biuret urea on leaf nitrogen and floral malformation

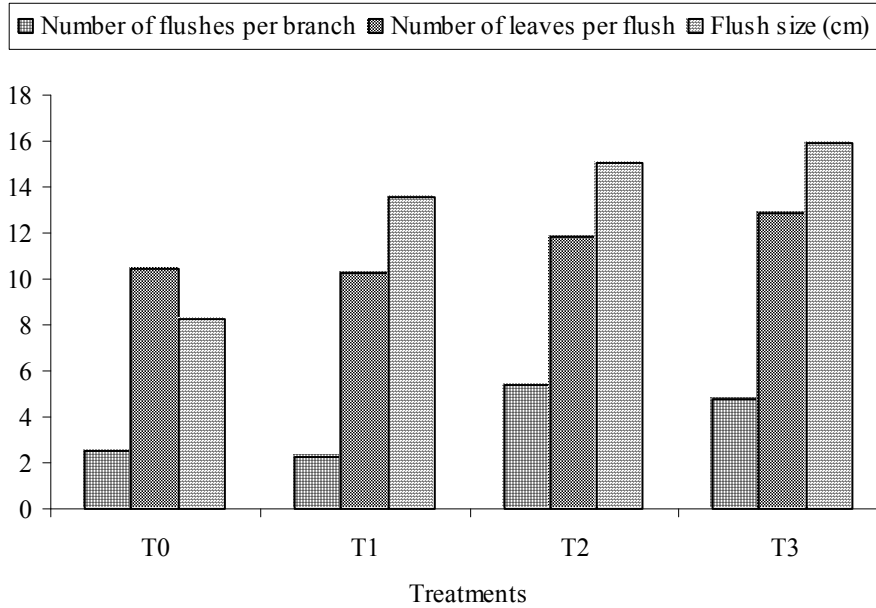


Figure 2: Effects of foliar application of low-biuret urea on vegetative performance of mango