

## Biochemical Analysis of Major Elements (N, P, K, Ca & Mg) in Seeds of *Tecomella undulata* from Twelve Provenances in Arid India

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### ABSTRACT

*Tecomella undulata* (Smith) Seemann (Bignoniaceae) is a valuable endangered species of Thar Desert in India. Seeds from twelve provenances of Haryana and Rajasthan were collected randomly from selected plus trees and stored in aluminium cans for determination of major elements (N, P, K, Ca, & Mg). Oven dried seeds of each provenance were powdered and digested with  $HNO_3$  and  $HClO_4$  to determine Nitrogen (Micro-Kjeldahl), Phosphorus (Spectrophotometer), Potassium (Flame Photometer), Calcium and Magnesium (Atomic Absorption Spectrophotometer). Variation for all the five elements observed among provenances. Maximum percentage of N & P was reported in Bhiwani provenance (2.28% and 0.49%), K in Rewari (0.56%) while Ca and Mg in Didwana provenance (1.84% and 0.56%). Likewise minimum values of these elements were estimated in different provenances. Variation in biochemical elements in seeds of different provenances is random in populations and is mainly due to different genotypes. Chemical nutrients in seeds have a great food and fodder value for desert animals and help to maintain ecological equilibrium in arid zone. Determination of major elements in seeds of Rohira is helpful to select the superior genotype of the endangered tree for afforestation programmes in arid India.

**Keywords:** *Tecomella undulata*, Provenance, Major elements, Genotype, Endangered.

### INTRODUCTION

*Tecomella undulata* (Smith) Seemann (Bignoniaceae) commonly called Rohira, Rugtrora and Desert Teak is an ornamental, agroforestry and endangered tree species which grows in patches along with *Prosopis cineraria* (Khejri) in Thar desert of north-western India (Arya et al., 1992). It is very

effective to control the shifting of sand dunes and erosion of loose sand in desert (Kumawat et al., 2012). Its population has severely decreased due to large scale cutting for timber, fodder and fuel by local people as well as its slow growth and poor regeneration capacity (Bhau et al., 2007).

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To conserve Rohira tree in arid zone of India, its germplasm should be preserved for breeding programmes and its genotype should be improved for reforestation purposes (Arya et al., 1997). Seeds of Rohira are light weight, dark brown coloured and narrowly winged having size 2 to 2.5 cm x 9 to 10 mm (Sharma & Tiagi, 1979). For identification of a population, biochemicals present in its seeds may be a relevant criteria (Hanover, 1974). Many elements (Cu, Zn, Mn, Fe, Ca, Cr, Na, Ni, Pb and Cd) were studied in leaves, bark and flowers of *Tecomella undulata* for its importance to prepare ayurvedic drugs (Saraf & Sankhla, 2013). Some studies have been reported to determine the biochemical elements in *Prosopis cineraria* (Arya et al., 1994), *Albizia lebbek* (Kumar & Toky, 1995) and in *Ficus benghalensis* (Govindan & Shoba, 2015). But, no comprehensive study has been reported so far to estimate the biochemical elements in seeds of Rohira tree with provenance trials. The present study reports the variation in five major elements (N,P,K,Ca, & Mg) in seeds of *Tecomella undulata* collected from twelve provenances of Haryana and Rajasthan in India.

#### MATERIALS AND METHODS

Seeds of *Tecomella undulata* were collected randomly from 12 provenances of Haryana & Rajasthan (India) ranging from 27° N to 29° N latitude and 73° E to 76° E longitude. 100 seeds of each provenance were cleaned, oven dried, crushed and sieved through a mesh. 1.0 g seed powder from each provenance is digested with 5 mL HNO<sub>3</sub> and 2 mL HClO<sub>4</sub>. Volume of filtered solutions were increased by adding deionized water for all the twelve provenances and 3 samples from each solution (provenance) were taken for biochemical analysis. Nitrogen (N) was analysed using Micro-Kjeldahl method, Phosphorus (P) by

Elico Spectrophotometer SL 171, Potassium (K) by Flame Photometer UK 405 while Calcium (Ca) & Magnesium (Mg) were estimated in the samples using a Perkin Elmer Model 306 Atomic Absorption Spectrophotometer. Statistical analysis was done to calculate C.D. at 5% level for each element.

#### RESULTS AND DISCUSSION

All the five major elements (N,P,K,Ca, & Mg) varied enormously among different seed sources (Table-1). Seeds of Bhiwani provenance have shown maximum N & P content (2.28% & 0.49%) while Sardarshahr has been reported minimum (1.35 % & 0.15%). Potassium (K) ranged from 0.12% (Bikaner) to 0.56% (Rewari). Ca & Mg were reported minimum in Rajgarh (0.86% & 0.20%) and maximum in Didwana provenance (1.84% & 0.56%). Variation among biochemical elements in seeds does not show significant correlation with the latitude of seed source, but these variations are mainly due to varied genotypes. Presence of different percentage of biochemicals in seeds determine its food and fodder value for desert animals like goat, sheep & camel. It is reported that seeds with greater contents of biochemical elements are enable to grow vigorously into seedlings (Lee & Fenner, 1989) and it also influences its tolerance capacity for survival in harsh environmental conditions (Alberdi et al., 1989). A strong correlation is observed in Ca & Mg content in seeds with survival percentage of six month old seedlings in nursery and it is reported that Didwana has maximum survival percentage (95%) as well as maximum Ca & Mg content (1.84% & 0.56%) in its seeds, like wise Rajgarh has minimum survival percentage (78%) and minimum Ca & Mg content (0.86% & 0.20%) (Arya et al., 1997).

**Table 1: Percentage of elements in seeds of different provenances of *Tecomella undulata***

Sr.No.	Provenance	N	P	K	Ca	Mg
01.	Jhumpa	1.95	0.39	0.31	1.52	0.52
02.	Bhiwani	2.28	0.49	0.25	1.42	0.41
03.	Rajgarh	1.50	0.26	0.17	0.86	0.20
04.	Sardarshahr	1.35	0.15	0.16	1.04	0.35
05.	Mohindergarh	2.08	0.40	0.51	1.65	0.53
06.	Rewari	1.88	0.47	0.56	1.72	0.50
07.	Jhunjhunu	1.89	0.44	0.20	1.70	0.54
08.	Bikaner	1.45	0.16	0.12	0.88	0.21
09.	Lachhmangarh	1.59	0.35	0.14	1.12	0.45
10.	Mukam	1.53	0.36	0.22	0.89	0.29
11.	Didwana	1.74	0.48	0.23	1.84	0.56
12.	Nagaur	1.52	0.30	0.17	1.42	0.40
<b>Replication</b>		1.92	1.48	1.50	3.66	1.15
<b>S.E. (D)</b>		1.11	0.04	0.05	0.12	0.08
<b>C.D. at 5% Level</b>		0.22	0.07	0.09	0.23	0.16

### CONCLUSION

The variation in five main biochemical elements in seeds reported in present study, is important for selection of superior genotype for the best adaptation in arid conditions. Most of the variations are due to genotype of the populations of different locations. Higher content of biochemicals or nutrients enhance the food and medicinal utility of seeds as well as help the tree species to adapt in harsh climatic conditions of the desert zone. A correlation between Ca & Mg content of seeds with survival capacity of seedlings in nursery is useful to select the superior seedlings to grow its orchards under afforestation programmes in arid conditions. As the *Tecomella undulata* has been listed as endangered species, so there is a great need to conserve this valuable tree species through ex-situ and in-situ measures.

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