Proximity effect on acacia and eucalyptus

SHEEL, S.K.*, RAJESH KUMAR* and
POKHRIYAL, T.C.**

ABSTRACT

The growth and development of a plant species is generally influenced, when grown in close proximity to another species. In this paper an attempt has been made to study the changes in some of morphological and biochemical parameters viz; nitrate reductase activity (NRA), fresh weight and aggressivity of Acacia nilotica and Eucalyptus Plants when grown together. It was observed that Acacia is a strong Competitor as compared to Eucalyptus. Such findings will be very useful in identifying and understanding the suitable species combination for the various afforestation programmes.

Introduction

Experiments on the variation in growth pattern of plant species in close planting have remained a matter of great interest. Such types of experiments have been termed in general as competition experiments. The effect of proximity or competition between plants of various species have been studied by Sakai (1950) Dewit (1960), Williams (1962), McGilchrist (1965), and Antonovich (1978) etc. Most of the available literature pertains to perennial plants. A little is known about the competition effect on woody forest species.

When plants of two or more species are grown to gather, there is a keen competition between them for moisture, light, nutrients and other essentials for their growth and development. Depending upon the species the growth or nutrients absorbing capacity may be enhanced, depressed or unaffected and accordingly the species may be graded as a good or bad competitor.

Though such studies are based on nursery trials which are certainly different as compared the field envi ronment but such trials will definitely be helpful in assessing the relative effects of close-planting of Eucalyptus and Acacia.

Meterial and Methods

The data pertains to an analytical work done by Statistical Branch for plant physiology Branch of F.R.I in respect of seasonal variation in nitrate reductase activity (NRA),Fresh and Dry weights of leaves, stems and roots of Acacia nilotica and Eucalyptus hybrid plants raised in earthen pots alone and together. Pots contained soil and farm manure in 3:1 ratio. Williams layout plan was followed where for two species, each replication contains four pots : (i) Eucalyptus alone, (ii) Eucalyptus in association of Acacia, (iii) Acacia lone, and (iv) Acacia association of Eucalyptus.

Six replicates were taken at monthly interval for estimation of the aforesaid characters under study.

As the species differ in their growth behaviour, the treatment effect generally vary largely with time. Hence logarithmic transformation of data was done for

*Statistical Branch, Div. of Facilities.
**Plant Physiology, Div. of Botany.
Forest Research Institute
P.O. New Forest
Dehradun-248006 (U.P.)

Results:

Table (1) Fresh weight per plant (gms.)

Plant parts	Eucalyptus Alone		Mixed	Sig. level	Acacia Alone		Mixed	Sig. level
Leaf	28.85	>	15.46	**	13.10	>	9.39	NS
Stem	32.72	>	14.30	***	41.06	>	29.74	NS
Root	38.57	>	17.43	***	19.82	>	16.20	NS

Table (2) Nitrogen Reductase Activity/Plant ha.$^{-1}$

Plant parts	Eucalyptus Alone		Mixed	Sig. level	Acaeia Alone		Mixed	Sig. level.
Leaf	2914	>	1561	***	2537	>	1334	NS
Stem	2854	>	1141	***	3977	>	2819	NS
Root	3035	>	1271	***	3823	>	2843	NS

Table (3) Aggressivity or Dominance of species

Ratio/Species	Acacia		Eucalyptus	Sig. level
Xij/Xii	0.85	>	0.50	**

Where

** indicates significance at 1% level

*** ,, ,, ,, 0.1% level

NS ,, not significant

Xii, Xij values in mono and mixed culture for fresh weights.

analytical purpose. Although williams (1962), McGilchrist and trenbath (1968) have given procedures for analysis for group of species taken together based on well known statistical methods but in the present study simple ANOVA technique has been applied to draw the valid conclusion.

For aggressivity or dominance of a species, the concept of Mc Gilchrist and Trenbath (1971) has been used i.e. the ratio of the values of fresh weights in mixed and mono culture (xij/xii) were subjected to F-test to find the level of difference between Acacia and Eucalyptus. The results have been depicted in the tables given above.

Discussions.

Analysis of data on Fresh weight and Nitrate Reductase Activity of different plant parts (Tables 1 & 2) reveal that Eucalyptus suffers very significant depression while grown in close proximity with Acacia. On the other hand Acacia though does not gain but remains statistically unaffected. It may be therefore, concluded that Eucalyptus is a more sensitive or delicate species as compard to Acacia since it lags behind in drawing nutrients for its growth and development while in competition. Low values under mixed culture for both the species indicates that supply of factors viz nutrient, moisture, etc., necessary for growth falls below the combined demand of both the species.

Table (3) shows that fall in the values in mixed culture as compared to monoculture is significantly more forEucalyptus than for Acacia. The average fall for Eucalyptus is approximately 50% while for Acacia is only 15%. On this basis Acacia may be said to be

dominant or a good competitor than Eucalyptus. Summarily it may be stated that growth of Eucalyptus shall be badly effected if grown together with Acacia.

ACKNOWLEDGEMENT

Authors are very grateful to Shri Rajive Kumar, I.F.S., Coordinator (Facilities) for providing a healthy atmosphere for such research work.

REFERENCES

Charles-Edward D.A. (1982) : Physiological determinants of crop-growth, p121, Academic Press

Evans C. Clifford (1972) : The quantitative analysis of plant growth. Blackwell Scient. Pub., London

McGilchrist C.A. (1971) & Trenbath B.R. : A revised analysis of plant Competition experiment Biometric, 27,659-671.

McGilchrist C.A. (1965) : Analysis of competition experiments. Biometrics, p 975-85.

Williams E.J. (1962) : The analysis of competition experiment. Aus J. Bio.Sc. 15,509-525.