

Effect of salt concentration on indole acetic acid production by *Rhizobium* sp. nodulating horse gram [*Macrotyloma uniflorum* (Lam.) Verdc.]

E. PRABHAVATI AND K.V. MALLAIAH*

Department of Microbiology, Acharya Nagarjuna University, Nagarjuna Nagar, GUNTUR (A.P.) INDIA

ABSTRACT

Production of indole acetic acid by salt tolerant strains of *Rhizobium* from horse gram [*Macrotyloma uniflorum* (Lam.) Verdc] was investigated. Out of 32 strains of *Rhizobium*, eight strains were found to be efficient for IAA production at various salt concentrations. These strains produced maximum indole acetic acid at control, 0.2M and 0.4M salt concentration. *Rhizobium* strains can be exploited for IAA production under salt stress.

Key words : Salinity, Salt stress, IAA, Salt tolerant, *Rhizobium*, [*Macrotyloma uniflorum* (Lam.) Verdc].

INTRODUCTION

Tropical soils are known for their deficiency in nitrogen under high salinity, temperature and acidic stress, which demand stress tolerant microorganisms for precise agricultural development (Hungria and Vargas, 2000). Reclamation of these soils through biological system is one sort of eco- friendly and cost effective approach. The *Rhizobium*-legume symbiosis is suggested to be the ideal solution to the importance of soil fertility rehabilitation of arid lands and is important direct for future research. The *Rhizobium* strains tolerant to extreme conditions of soil salinity, temperature and pH can help to improve biological nitrogen fixation and thus help in soil amelioration. Stress tolerant Rhizobia, which show PGPR activities [such as production of phytohormones like indole acetic acid (IAA), siderophores and solubilization of minerals] under high salinity are desirable for further selection and improvement of the strain and other commercial applications. Application of hormones can benefit plants under salt stress (Prisco and O'Leary, 1973 and Zhao *et al.*, 1980). Though much literature is available on the role of microorganisms on IAA production, very little information is available on the effect of salt stress on IAA production by bacteria. Hence, the present study was undertaken to investigate the influence of salt concentration on the production of IAA.

MATERIALS AND METHODS

The *Rhizobium* strains were isolated from horse gram [*Macrotyloma uniflorum* (Lam.) Verdc] plants growing in thirty two soil samples collected from various parts in Andhra Pradesh. These *Rhizobium* strains were authenticated by nodulation tests. They were designated as HGR1 to HGR32. These strains were found to be highly salt tolerant. All the thirty two strains were

screened for IAA production at various salt concentrations from 0 - 2M containing 0.1% L- tryptophan. The formation of indole compounds was detected by using Kovac's reagent. All the strains were positive for indole production up to 1M salt concentration. Eight strains showed IAA production even at 2M salt concentration. The rhizobial strains HGR4, HGR6, HGR8, HGR13, HGR18, HGR22, HGR23 and HGR30 which showed IAA production at 2M salt concentration were selected to study the quantitative measurement of IAA at various salt concentrations. For this, yeast extract mannitol broth containing different concentrations of sodium chloride from 0 (without salt), 0.2M, 0.4M, 0.6M, 0.8M and 1M were supplemented with 0.1% L-tryptophan. They were inoculated with 1ml of inoculum of each strain and were incubated for twenty days on gyratory shaker at $28 \pm 2^\circ\text{C}$. Culture broth was centrifuged at 10,000g for 15 minutes. The pelleted bacterial cells were separated by filtration and the supernatant was used for the estimation of IAA by the method described by Reddy and Reddy (2002). To find out the maximum production of IAA by these *Rhizobium* strains, IAA was determined for every 24hr up to twenty days. Uninoculated flask was kept as control.

RESULTS AND DISCUSSION

The amount of IAA produced by these strains (Table 1) was determined. The production of IAA was maximum between four to ten days except only one strain (HGR5 produced after fifteen days). Eleven strains showed high IAA production at their maximum growth. The remaining strains showed no correlation between the maximum production of IAA and their growth. The amount of IAA produced varied from 32.0 $\mu\text{g/ml}$ (HGR2) to 116.0 $\mu\text{g/ml}$ (HGR8).

The amount of IAA produced by these strains varied with salt concentrations and the strain involved (Fig.1).