

EVALUATION OF NODULATION AND NODULE ACTIVITY
OF CHICKPEA (Cicer arietinum L) AND PIGEONPEA
(Cajanus cajan L. Millsp.) IN SELECTED DRY ZONE SOILS

By

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ABSTRACT

A series of pot experiments were conducted at the Faculty of Agriculture, Peradeniya to study the effect of native rhizobia and fertilizer nitrogen on growth and yield of chickpea and pigeonpea on two soils of the dry zone, namely Kalankuttiya and Maha-Illuppallama.

A sufficient number of *Bradyrhizobium* was recorded in both soils. However, nodulation was not observed on chickpea in both soils. Pigeonpea showed a certain degree of host specificity. Application of starter nitrogen as urea (46% N) increased the dry matter accumulation and yield of both crops and nodulation parameters of pigeonpea, although not significantly. Higher rhizobia population in Maha-Illuppallama soil resulted in a significant increase in nodulation. Nodule number and nodule mass increased up to pod filling stage. However, the acetylene reduction activity (ARA) was maximized at 50% flowering stage.

Native rhizobia were isolated from nodules of pigeonpea at two locations. These strains were purified and examined. Purified isolates were compared with a standard strain TAL 1127. Three strains were slow growers as the test strain, and were authenticated on pigeonpea. Strain K1 produced higher shoot dry weight and reduced more acetylene than the others.

Assessment of the effects of *Rhizobium* inoculation on different cultivars of the selected species showed that interaction between

inoculation and cultivar was not significant for all parameters measured in pigeonpea. There were significant differences in nodule number, ARA, dry matter production and total nitrogen content (%) between the cultivars of pigeonpea in both soils. Cultivar ICPL 840045 was the superior in terms of nodule activity and shoot dry weight in both soils.

A *Rhizobium* strain and cultivar interaction were found in nodule dry weight and nodule activity of chickpea in both soils. The strain TAL 1148 was highly effective on ICCV 32 and Annegiri, while TAL 620 showed good symbiotic association with ICCV 2 and ICCV 4.

The effects of inoculation and fertilizer nitrogen on nodulation and growth of chickpea and pigeonpea were also studied. The treatments used were inoculation, no inoculation, fertilization with 0, 25, 50 and 75 kg N/ha urea in a factorial combination. Chickpea cv. ICCV 32 and pigeonpea cv. ICPL 840045 were used for both soils.

The interaction between the two factors was not significant for all parameters measured in both crops. The application of 25 kg N/ha gave a significant increase in symbiotic activity but 75 kg N/ha reduced this phenomenon. The application of 50 kg N/ha showed a higher nodule activity, although the increase was not significantly different from 0 kg N/ha. The application of increasing doses of nitrogen fertilizer increased the shoot dry weight, the difference in dry weight being significant between 0 kg N/ha and 75 kg N/ha. The number of pods/plant also significantly increased with urea. The increases

were 25.79% and 24.58% over 0 kg N/ha at 75 kg N/ha of pigeonpea in Maha-Illuppallama and Kalankuttiya soil respectively. Increments of 28.97% and 30.06% were recorded for chickpea in Maha-Illuppallama and Kalankuttiya soils.