ABSTRACT

Two sets of experiments were conducted at the Teaching Farm, Mondouri, Bidhan Chandra Krishi Viswavidyalaya, West Bengal during the rabi seasons of 2002-03 and 2003-04 to study the nitrogen use efficiency in sweet potato through biofertilizers and organic manures.

I. Growth parameters like leaf area index, aerial dry matter production and crop growth rate increased up to 90 DAP but declined thereafter. The treatment T1 (recommended dose of nitrogen) influenced the growth parameters up to 60 DAP but thereafter the treatment T12 (2/3rd recommended dose of N + Azospirillum + Azotobacter as vine dipping) showed its superiority over the others.

Tuber dry matter production and tuber bulking rate increased linearly from 60 DAP onwards up to maturity (120 DAP) and the highest values were recorded with the treatment T12 at all the tuber development stages but the tuber sink potential (316.47 g m⁻² LAI⁻¹) was the highest in control treatment (T15) at 120 DAP. The highest number of marketable tuber per plant (3.17), the largest average tuber weight (124.00g) and the highest tuber yield (28.95 t ha⁻¹) were recorded with the treatment T12. Higher level of N along with biofertilizer was found promising compared to lower level coupled with biofertilizer. The conjoint application of Azospirillum and Azotobacter was found to be more effective than their single application. While considering the comparative efficacy between biofertilizers, Azospirillum was more responsive than Azotobacter. The superiority of vine dipping vis-a-vis soil application was also observed with respect to yield and yield attributes.

Though the highest nitrogen content in both vine and tuber was recorded with the treatment T1 but higher uptakes were computed with the treatment T12. The treatment T12 also recorded the maximum phosphorus and potassium content and their uptakes in vine and tuber. Crude protein content in vine followed the same trend as that of N content in vine. The highest starch content (22.16%) was obtained with the treatment T1 but in case of sugar content, it was the highest (2.86%) with the control treatment (T15).

Though the highest nitrogen harvest index (59.96%) was computed with the treatment T4 (2/3rd RDN + Azospirillum as vine dipping), but the maximum nitrogen
use efficiency (538.63 kg kg $\text{N uptake}^{-1}$) was from treatment $T_{14}$ (P and K only). Application of biofertilizer has a positive influence on residual N and P content of soil but not on K. The highest net return (Rs. 64606/- ha$^{-1}$) and net return per rupee investment (Rs. 2.90/-) were recorded with the treatment $T_{12}$.

II. The growth parameters like leaf area index, aerial dry matter production and crop growth rate increased linearly from 30 DAP onwards and continued up to harvest (120 DAP). With respect to growth parameters, the treatment $T_1$ (100% N from urea) was found more promising at the initial stages but at later growth stages, the treatment $T_{13}$ (25% N substitution by FYM) showed its superiority over others.

Tuber dry matter production and tuber bulking rate increased linearly up to 120 DAP and the highest values were recorded with the treatment $T_{13}$. But the highest tuber sink potential was computed with the control treatment ($T_{14}$). Though the number of marketable tuber per plant (2.80) was more in treatment $T_{11}$ (25% N substitution by mustard cake) but the average tuber weight (130.60 g) and tuber yield (26.19 t ha$^{-1}$) were more with the treatment $T_{13}$. In general, with the increasing level of inorganic N substitution by organic manures from 25 – 100%, the tuber yield decreased and FYM was found to be more effective than mustard cake and neem cake at each level of substitution.

The nitrogen and potassium content in both vine and tuber were maximum in the treatment $T_4$ (100% N from FYM) but their uptakes were more in treatment $T_{13}$. Whereas in case of phosphorus, the highest values were recorded with the treatment $T_4$.

The highest starch content (21.00%) and sugar content (3.05%) were recorded with the treatment $T_4$ and $T_{14}$ respectively. But the crude protein content in vine followed the same trend as that of N content in vine.

Both nitrogen harvest index (49.69%) and nitrogen use efficiency (463.40 kg kg $\text{N uptake}^{-1}$) were the maximum in the treatment $T_{14}$. The residual nutrient status of the soil after harvest improved with the increasing level of inorganic N substitution by organic manures irrespective of source. In general, total cost increased with the increasing level of inorganic N substitution by organic manures. However, the highest net return (Rs. 55,233/- ha$^{-1}$) and net return per rupee investment (Rs. 2.37/-) were recorded with the treatment $T_{13}$. 