

ABSTRACT

WATER, NITROGEN AND PHOSPHORUS MANAGEMENT IN RICE-BASED CROPPING SYSTEMS WITH OILSEEDS AND PULSES

In order to raise the productivity of cereal, oilseeds and pulses in cropping systems without impairing land productivity, experiments were undertaken on two crop rotations namely, Rice-Mustard-Greengram and Rice-Lentil-Sesamum during 1982 to 1985. The first rotation was started with greengram under different phosphorus and irrigation levels during summer season with the objective to save the amount of N and P for the succeeding crop of rice grown during 'Kharif' (July-October). The aim was also to harvest the residual phosphorus by rice and mustard in sequence to greengram crop. The second rotation was planned to study the effect of phosphorus on lentil crop and the carry-over effect of N and P on the succeeding oil seed crop (sesamum) grown during the summer season. The effect of irrigation to these crops were also studied to develop suitable irrigation schedules for these cropping systems.

The application of 60 kg P_2O_5 /ha to greengram and lentil increased nodulation, N and P uptake, grain yield, WUE and contributed substantial amount of N and P for the succeeding crops of rice and sesamum respectively. The greengram irrigated under 0.7 IW/CPE and lentil with 0.5 IW/CPE ratio increased WUE, N and P uptake and grain yield. For the successful nodulation of these crops, frequent irrigation proved to be beneficial. A combination of 60 kg residual P and 20 kg P_2O_5 /ha directly applied to rice was found to be as good as any level of residual

and directly applied P or combination of both. The sesamum grown on the residual level of 60 kg P_2O_5 /ha applied to lentil crops with 40 kg/ha direct applied N gave significantly higher grain yield than other treatment combinations. The irrigation level of 0.8 IW/CPE ratio for sesamum crop was found to be better than other treatments with respect to nutrient uptake, grain yield and WUE of sesamum. The application of 90 kg N/ha to rice and mustard crops increased N and P uptake and also grain yield as compared to other treatment combinations. The response of mustard to directly applied phosphorus was not observed particularly where its higher doses were applied in the cropping system to greengram and rice crops. Otherwise, 30 kg P_2O_5 /ha was sufficient for the mustard crop. The mustard irrigated under 0.8 IW/CPE ratio and rice one day after disappearance of ponded water increased the WUE, N and P uptake and grain yield. The study revealed that crops irrigated frequently extract more moisture from upper profile, whereas, under limited irrigated condition, more soil moisture was extracted from deeper profile. The application of N and P fertilizers and inclusion of greengram and lentil increased the N and P status of the soil after the harvest of the crops and proved to be beneficial to subsequent crop. Thus, their inclusion in the rotation helped in maintaining the fertility status of the soil.

Key words

Crop rotation, Cumulative, Days after disappearance, Direct, Evaporation, Irrigation, IW/CPE, moisture extraction, Nitrogen, Nodulation, Nutrient content, Nutrient status, Nutrient uptake, Oilseeds, Phosphorus, Pulses, Residual, Submergence, Water requirement,