
EFFECT OF MINERAL FERTILIZERS ON THE GROWTH AND DEVELOPMENT OF SOYBEAN CULTIVARS

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Relevance

Soybean (*Glycine max* (L.) Merr.) is a protein and oil crop that is attractive for diversifying irrigated cropping systems in Uzbekistan, where it is grown mainly as a second crop after winter wheat [1]. The soils of the Fergana region are only moderately supplied with nutrients: light gray (light sierozem) soils of southern Fergana contain about 1.3% humus and 0.11% total nitrogen in the plough layer [2], and irrigated meadow-gray soil in the Andijan area had 1.21% humus and 0.148% total nitrogen in the topsoil [1]. Mineral fertilizers are therefore an important lever for plant growth and yield, but the rates and ratios suitable for soybean on these soils are not well established.

Keywords: Soybean, mineral fertilizers, growth and development, cultivars, light sierozem, Fergana, nitrogen, phosphorus, potassium.

Aim

The aim of this work was to summarize evidence on how nitrogen, phosphorus, potassium and related inputs affect the growth and development of soybean cultivars.

Nitrogen

Biological nitrogen fixation supplies about 50-60% of soybean nitrogen demand, and in a review of 637 data sets fertilizer nitrogen was more likely to increase yield when yield exceeded 4.5 Mg/ha [3]. In a two-year trial with four cultivars, 30 and 60 kg N/ha increased plant height and chlorophyll index (SPAD) but did not significantly increase seed yield, and the cultivar effect was larger than the nitrogen effect [4].

Phosphorus and potassium

Phosphorus and potassium raised nodule number per plant, potassium also increased nodule weight and pods per plant more than phosphorus, and the highest response was obtained when both were applied; phosphorus above



15 kg/ha did not raise yield, while yield rose with potassium up to 112 kg/ha when 60 kg P/ha was applied [5].

Inoculation and micronutrients

In the Fergana Valley, seed inoculation of cultivar Orzu with a Rhizobium-based biofertilizer raised seed yield from 1.43-1.54 Mg/ha in controls to up to 2.12 Mg/ha, increased the number of nodules per plant from 13.1 at budding to 22.1 at pod formation in the best treatment, and increased seed protein to 46.3% [1]. On a low-fertility sandy soil in the Philippines, Bradyrhizobium inoculation and foliar molybdenum raised seed yield from 1.37 t/ha to 2.06 t/ha in combination [6]. Cultivars differ in yield components such as pods per plant, seeds per plant and 1000-seed weight across regions of Uzbekistan [7], so fertilizer response has to be tested on each cultivar.

Conclusion

The evidence suggests that, on soils of the Fergana type, soybean growth and development depend more on effective nodulation and on phosphorus and potassium supply than on high rates of nitrogen. No factorial N-P-K trial on light sierozem soils was identified, so region-specific fertilizer rates cannot yet be recommended and a multi-season field experiment with locally adapted cultivars is needed.

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