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ABSTRACT

Plant pests and declining soil fertility are among the major limitations to the production of grain legumes in Kenya. Two field experiments were concurrently conducted to investigate the response of grain legumes to pesticide spray and nitrogen source. A greenhouse experiment was also conducted to investigate the effect of rhizobia inoculation and fungicide treatment on fungal root rots, nodulation and dry matter accumulation of selected grain legumes. Five grain legumes namely common bean (*Phaseolus vulgaris* L.var GLP 2), lima bean (*Phaseolus lunatus* L.), green grams (*Vigna radiata* L.), lablab (*Lablab purpureus*) and chickpea (*Cicer arietinum*) were tested. The field experimental design was a randomized complete block design in a split plot arrangement. Pesticide spray and the legume species were the main plots while the legume species and the nitrogen sources were the subplots for experiment I and II respectively. Parameters observed were; insect pest and disease incidences and damage, nodulation, plant growth, yield and yield components. The greenhouse experiment was laid out in a completely randomized design. Treatments included, inoculation of legumes with pathogen alone or with appropriate rhizobia alone or application of fungicide or their combinations and a control.

Chemical pesticides significantly reduced the incidence of insect pests and foliar fungal diseases assessed by more than half in all the legume species and so were pod and seed damage in lablab, green gram and chickpea. Spraying significantly increased the grain yield of chickpea and lablab by 1413 and 2276 kg in the long rains corresponding to 614 and 761 kg in the short rains respectively. Benefit-Cost analysis showed that it is profitable to apply pesticides to control pests and diseases in lablab, green gram and chickpea but not in GLP 2 and lima bean. Fertilizer application significantly reduced nodulation in most of the legume species, but significantly increased plant height and shoot dry matter. In contrast, inoculation increased number of nodules and nodule dry matter in most species but this was not translated into increased dry matter accumulation and yield. Manure application improved nodulation and grain yield only in the short rains. All the nitrogen sources had no effect on number of seed pod\(^1\) and 100 seed weight. Results of the greenhouse experiment indicated that *Sclerotinia* and *Rhizoctonia* were more pathogenic than *Fusarium* and *Macrophomina*. Rhizobia inoculation significantly increased number of nodules per plant in most species. Fungicide seed treatment reduced disease incidence on *Sclerotinia* and *Rhizoctonia* inoculated plants but significantly reduced nodulation of the legumes. However, effect of fungicide on nodulation was significantly suppressed when applied together with rhizobia on infected seeds. The results suggest that combining fungicide with rhizobia is more effective when the aim is to control disease as well as increase nodulation of the legumes than when each was applied alone.

The results suggested that chemical pesticides sprays are beneficial in pest management in chickpea, green gram and lablab but not in common bean and lima bean. Effect of nitrogen fertilizer, farmyard manure and rhizobia inoculation on grain legume depend on soil nutrient status and other environmental factors. Simultaneous use of fungicide seed treatment and rhizobia inoculation is more effective than when each treatment was applied separately.