

## Abstract

Groundnut is the fourth most important source of edible oil and the third most important source of vegetable protein in the world. Despite its demands outweighing its supply, productivity remain low due to lack of commensurate recommendations on good agronomic practices. Groundnut yields are relatively very low in Kenya compared to other countries. The world average yields of groundnuts stand at 1447 Kg/ha, while in Asia is 1798 Kg/ha, in Nigeria and most part of West Africa is 930 Kg/ha, South Africa 2000 Kg/ha, and in Kenya is 575 Kg/ha .This is attributed to poor agronomic practices and low soil fertility, with phosphorous (P) being the most limiting factor. This study aimed at determining the effect of rate and time of phosphorous application, and planting densities on growth and yield of groundnuts. The study was conducted in two locations, Chuka University Horticultural Demonstration Farm and Kenya Agricultural and Livestock Organisation, Embu, Kenya between April and August 2018. The study used a 2 x 3 x 3 factorial experiment laid out in a Randomized Complete Block Design with three replications. There were three factors; P application rates (0, 30, and 60 Kg/ha), time of P application (at sowing, and 14 days after sowing), and planting densities (148,149; 213,331 and 333,334 plants per ha). Data on crop emergence, days to 50% flowering, plant height, days to physiological maturity, number of kernels per pod, number of empty pods and yield of groundnuts was collected. Data collected was subjected to analysis of variance using Statistical Analysis Software version 9.4. Significant means were separated using Least Significance Difference at 5% probability level. The results of the study showed that rate and time of phosphorous application and planting densities had a significant effect ( $p < 0.05$ ) on both growth and yield of groundnuts. Application of 30 Kg/ha of P at sowing with a plant density of 333,334 (30 cm by 10 cm) plants per ha gave the highest germination percentage, fewer days to flowering of groundnuts and consequently fewer days to physiological maturity. Contrary, application of 60 Kg/ha of phosphorous at sowing with a plant density of 148,149 (45 cm by 15 cm) resulted to low germination percentage of the groundnuts. On the other hand, application of 60 Kg/ha of P at 14 days after sowing at plant density of 148,149 plants per ha prolonged the growth period of the groundnuts. Application of 0 Kg/ha of P at a plant density of 333,334 plants per hectare resulted in faster maturity but with lower yields. Application of 60 Kg/ha of Phosphorous applied at sowing and at a plant density of 148,149 plants per hectare gave the highest plant heights. The highest kernel yield obtained was 1,659.90 Kg per hectare, which was obtained by applying 30 Kg/ha of P applied at sowing with a plant density of 333,334 plants per hectare. The study showed that use of appropriate agronomic practices can led to sustainable groundnut production, thus ensuring food security and improved farmers income. The study recommends spacing of 30 x 10 cm and application of 30 Kg/ha of Phosphorous at sowing for sustainable groundnuts production in the study area and within similar agro-ecological zones.