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Application of Response Surface Methodology on the yield of maize as a fodder crop

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Maize is one of the stable foods in Kenya, and it is gaining prominence as an animal fodder crop for cattle farmers. As technology improves, and people abandon the traditional nomadic pastoralism, there is a need to have adequate storage of animal feeds to sustain animals around the season. The most important quality of fodder crops is to be lush, tall, and bushy, a characteristic determined by nitrogen uptake, facilitated by water, phosphate, and potassium. In this research, the investigation sought to ascertain the optimal vegetative yield of maize with minimum water supply using Response Surface Methodology (RSM) in semi-dry soil enriched with NPK, in a controlled greenhouse environment. The experimental treatments were determined using the Central Composite Design based on varying levels of water supply (10%, 25%, and 50% of soil field capacity), nitrogen (10, 15, and 25 g hole-1), and phosphorus and potassium equally applied at (5, 10, 15g hole-1). The investigation's findings demonstrated that increased nitrogen fertilization rate positively influenced all agronomic traits, but left high nitrogen concentrations in the soil due to minimal absorption media. Nitrogen increased plant bush weight, and leave area, but minimal water supply curtailed the plant height and agronomic attributes. The optimal levels of irrigation and nitrogen fertilizer were found to be 42.73 –47.80%, and 3.38–5.69 g hole-1 respectively. The optimal amounts for NPK retention in soil and plant uptake were 82.57 – 98.00%, and 4.20–5.98 g hole-1, respectively. The study concluded that plants with minimal water supply, like that of semi-arid areas, require nitrogen levels not greater than 50% per hole, since excess was seen to cause leave necrosis. The availability of other nutrients was however seen to plant biomass and enhance nutrient uptake.

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