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Effect of farmyard manure rates combined with nitrogen fertigation on sesame yield, nitrogen fertilizer equivalency ratio and seed micronutrient statues

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Objectives: Sesame (a summer crop) is not traditionally grown on calcareous reclaimed land. These trialsaimed to evaluate the use of farmyard manure applied at 3 rates, in developing sesame as a new crop for this type of land under drip irrigation. Another objective was to determine Nitrogen Fertilizer Equivalency Ratio of farmyard manure and Seed micronutrient statues under sucha calcareous soil.

Methods: Field trials were established in the summer seasons of 2011 and 2012 on a private farm, Belbais District; Sharkia Governorate in a newly reclaimed desert soil(loamy calcareous) to investigate the effect of different farmyard manure (FYM) rates 5, 10 and20 m^3 fd^{-1} (fd^{-1}=feddan=4200 m^2), with and without adjusted N rate(30 kg fd^{-1}), compared with N fertilizer levels: 0, 15, 30 and 45kg fd^{-1} through fertigation on sesame yield and nitrogen fertilizer equivalency, allunder drip irrigation. The design of the trial was complete randomized block design. Sesame variety (Mutation 48) was sown under drip irrigation. The sesame was harvested and the yield components determined (seed yield, and oil content). The seeds were also analyzed for macro and micro nutrients. Correlation analysis of the various yield characteristics with N fertilizer application was carried out.

Results: The results showed that highly significant effects of the soil amendment treatments were apparent on seed yield (kg fd^{-1}), 1000 seed weight (g) and number of branches per plant. Smaller yield response to FYM application at the lowest rate of addition compared with the other two rates was observed. Furthermore, in contrast to the patterns of crop yield response to N fertilizer, no increase in crop yield was observed at the highest rate of FYM compared with the highest N rate. Correlation analysis of the various yield characteristics with N fertilizer application showed that seed yield, capsule number and number of branches per plant were raised significantly with increasing rate of applied mineral N. Linear regression models which formed the basis of calculations of N fertilizer equivalency values for the FYMshowed that the crop response to applied FYM and inorganic N fertilizer followed a linear pattern. The N equivalency value of FYM estimated from the regression coefficients of the linear models and in relation to inorganic N fertilizer reached 62%(Table1). The chemical analysis of sesame seeds indicated that there was evidence of improved status of P and Cu in sesame seed treated with FYM compared to inorganic fertilizer application. In general, however, the chemical composition of sesame seed was insensitive to the type of soil amendment. The chemical composition of sesame seed tested by ANOVA showed that only P, Fe, Mn and Cu concentrations in sesame seed were significantly affected by the experimental treatments. The effects on Fe and Mn were relatively marginal ($P = 0.049$ and $P = 0.025$, respectively). However, the effect on Cu concentration was highly significant ($P = 0.004$). Copper and P concentrations in sesame seed were scrutinized further using a means comparison test (t-test) to compare the mean effects of the different manure treatments on these elements relative to the inorganically fertilized and untreated control means (Table2). The results showed in each case that the organic materials significantly improved the seed status of these elements compared to inorganic fertilizer.

Conclusion: The study suggests predictable benefits to crop production and yield from FYM application to agricultural desert land. This will increase farmer confidence in organic products as fertilizer materials and soil conditioners, reducing the reliance on inorganic fertilizers for crop nutrition as well as increasing the seed status of some macro and microelements.

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