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Cattle manure and bio–nourishing royal jelly as alternatives to chemical fertilizers: Potential for sustainable production of organic *Hibiscus sabdariffa* L.

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Abstract

For sustainable and organic farming, organic manures such as cattle manure (CMn) and bio-nutritious substances such as royal jelly (RJ) should be used as complete or at least partial alternatives to chemical fertilizers (CFs). Therefore, two consecutive trial seasons (2018 and 2019) were conducted to study the effect of soil fertilization with CMn and/or CFs in combination with foliar spraying with RJ on growth, yield, and chemical composition of roselle (*Hibiscus sabdariffa* L.) plant and seed. The results indicated that spraying roselle plants with RJ resulted in a significant increase in all parameters studied over the control; however, this increase was enhanced when RJ was combined with soil fertilization. The highest values for most of the growth traits, chemical composition of seeds, sepal anthocyanin and vitamin C contents, and sepal acidity were obtained by applying 2 or 4 g RJ L^{-1} + (30 m3 CMn ha^{-1} + 50 % dose CFs). In addition, the highest values for yield components and plant chemical composition were obtained by applying 2 or 4 g RJ L^{-1} + (0 m3 CMn ha^{-1} + full dose CFs). The results also indicated that applying CMn in combination with RJ gave values mostly close to those of CFs treatment. In conclusion, the results recommend the use of RJ (2 g L^{-1} as a foliar feeding) along with CMn (30 m3 ha^{-1}) as a partial alternative to chemical fertilizers for sustainably producing healthy roselle sepals.