Efficient mineral nutrition of root crops grown on sandy soils in ISRAEL, NW NEGEV arid zone

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Traditionally, mineral nutrition of organic root crops in the north-west Negev leaned heavily on fully-ripened cattle manure compost (CMC) complemented with either feather mill and/or guano at the expense of ~€1800/ha. These were base applied and a portion of the N-rich additives was side-dressed by incorporation before canopy closure. The latter inevitable result was ammonia poisoning of carrot seeds and plantlings and tuber distortions. Furthermore, technical irrigations prior and after seeding resulted in leaching of nitrates (and other fertility components), while the remaining N-mineralization capacity failed to support the crops’ N demands (rate and quantity alike), especially that of carrot whose N demand strongly enhances at 3-4 months after seeding. The symptoms thus observed are low leaves total N content, low petioles nitrates (~100 vs. >700 mg L⁻¹), diseasing (e.g., by Alternaria, Rhizoctonia solani), yellowing and rapid aging of the canopy, easy detachment of carrots leaves, and reduction of total and Class A quality.

Introducing pasteurized broilers litter (PBL), a calf feed additive, to organic root crops production, solved these problems. Pasteurization (48-h at 70 °C in aerated, 30 m³ chambers) preserved the litter chemical composition with OM, OC, ON, P and K contents at 84%, 37, 5, 1.4, and 2.2% (w/w), respectively, 1.5-3 times more than in CMC. Furthermore, N mineralization potential (at 100-d incubation period) remained at >50% of ON compared with the <15% of OM in CMC.

In addition to shifting to PBL application (at 15 tons ha⁻¹), we also modified the application modes by splitting the manure dose, where 2/3 were applied at seed bed preparation (base application) while the rest (as well-ground PLB) was side-dressed (in 1 or 2 moves) by spreading on top of the crop and sprinkler irrigating for wash into the soil. The number of side dressing tested was 0-2, and increasing loads at base application made side dressing rather redundant. Importantly, not only crop nutrition problems were solved, costs were halved to within the range of costs encountered under conventional growing, with similar yields.

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