

The Effect of Organic Matter Substitutes in Soil Types on Kale (*Brassica oleracea* L.) Growth

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Normally, soils low in humus cannot grow "superfoods", such as kale, due to their need for rich soil. In soil, humus adds organic compounds to improve soil porosity and microorganism and enzymatic activity, while reducing soil erosion and nutrient leaching. Asian folk tradition says that adding green tea leaves directly to soil improves plant growth. Both compost and peat moss can also be added to soils as humus additives. Using 21 different well characterized soil mixtures, 228 plants were planted using organic compost compared with tea leaves in Trial 1, and with peat moss in Trial 2. Into each pot, 20.0 ± 0.1 g of mixes of pure fine quartz sand, kaolinite clay, and organic compost was added in two phases compressed to 4.0 ± 0.1 cm, with one seed placed at 3.0 ± 0.1 cm depth. Plant height, sprouting time, sprouting ratio, and longevity was measured daily. In Trial 1, kale did not grow in any green tea group, but did in most compost groups. In 20-40 wt% clay mixed with 60-80 wt% sand but no compost, and in 100 wt% compost, plants had the fastest mean sprouting time at 1.0 day. Overall, 60 wt% sand, 20 wt% compost, 20 wt% clay was the best soil mix, yielding the highest mean plant height at 15.1 ± 0.6 cm on Day 55, fresh live mass (0.46 g), and biomass (40.6 mg), as well as a high sprouting ratios, mean sprouting times at 5.6 days, and plant longevities at 18.5 days. In Trial 2, kale grew only in soil groups having 80 wt% peat moss with either 20 wt% sand or clay, and in 60 wt% peat moss, 40 wt% sand. Among the peat moss groups, 20 wt% sand, 80 wt% peat moss yielded the shortest mean sprouting time at 16.5 days, the tallest mean plant height at 1.2 ± 0.7 cm on Day 55, fresh mass, 3.79 g, and biomass, 2.09 mg, as well as one of the highest sprouting ratios 50%, mean sprouting times 5.67 days, and plant longevity 8.63 days. Although peat moss did yield more kale growth than tea leaves, neither could not effectively replace compost for kale growth. Future tests will examine other organic matter substitutes, such as manure.