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Diversified Farming and Agronomic Interventions Improve Soil Productivity, Soybean Yield and Biomass under Soil Acidity Stress

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Abstract : One of the factors affecting crop production and nutrient availability is acidic stress. The most important element decreasing under acidic stress conditions is phosphorus deficiency, which results in stunted growth and yield because of inefficient nutrient cycling. At the Agriculture Research Institute Mingora Swat, Pakistan, tests were carried out for the first time throughout the course of two consecutive summer seasons in 2016 (year 1) and 2017 (year 2) with the goal of increasing crop productivity and nutrient availability under acidic stress. Three organic supplies (peach nano-black carbon, compost, and dry-based peach wastes), three phosphorus rates, and two advantageous microorganisms (Trichoderma and PSB) were incorporated in the experimental treatments. The findings showed that, in conditions of acid stress, peach organic sources had a significant impact on yield and yield components. The application of nano-black carbon produced the greatest thousand seed weight of 164.6 g among organic sources, however the use of phosphorus solubilizing bacteria (PSB) for seed inoculation increased the thousand seed weight of beneficial microbes when compared to Trichoderma soil application. The thousand seed weight was significantly impacted by the quantities of phosphorus. The treatment of 100 kg P ha-1 produced the highest thousand seed weight (167.3 g), which was followed by 75 kg P ha-1 (162.5 g). Compost amendments provided the highest seed yield (2,140 kg ha-1) and were comparable to the application of nano-black carbon (2,120 kg ha-1). With peach residues, the lowest seed output (1,808 kg ha-1) was observed.Compared to seed inoculation with PSB (1,913 kg ha-1), soil treatment with Trichoderma resulted in the maximum seed production (2,132 kg ha-1). Applying phosphorus to the soybean crop greatly increased its output. The highest seed yield (2,364 kg ha-1) was obtained with 100 kg P ha-1, which was comparable to 75 kg P ha-1 (2,335 kg ha-1), while the lowest seed yield (1,569 kg ha-1) was obtained with 50 kg P ha-1. The average values showed that compared to control plots (3.3 g kg-1), peach organic sources produced greatest SOC (10.0 g kg-1). Plots with treated soil had a maximum soil P of 19.7 mg kg-1, while plots under stress had a maximum soil P of 4.8 mg kg-1. While peach compost resulted in the lowest soil P levels, peach nano-black carbon yielded the highest soil P levels (21.6 mg kg-1). Comparing beneficial bacteria with PSB to Trichoderma (18.3 mg/kg-1), the former also shown an improvement in soil P (21.1 mg kg-1). Regarding P treatments, the application of 100 kg P per ha produced significantly higher soil P values (26.8 mg /kg-1), followed by 75 kg P per ha (18.3 mg /kg-1), and 50 kg P ha-1 produced the lowest soil P values (14.1 mg /kg-1). Comparing peach wastes and compost to peach nano-black carbon (13.7 g kg-1), SOC rose. In contrast to PSB (8.8 g kg-1), soil-treated Trichoderma was shown to have a greater SOC (11.1 g kg-1). Higher among the P levels.

Keywords : acidic stress, trichoderma, beneficial microbes, nano-black carbon, compost, peach residues, phosphorus, soybean
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