Short term co-application of fly ash and lime milk sludge with biosolid in field: plant and soil available micronutrients

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Abstract

A three year experiment with wheat on the same plots was established in 2006 to determine the effects of co-applications fly ash and lime milk sludge together with biosolid on plant growth and nutrition. The plots received varying rates of wastes for first and second years and none for third year. The medium co-application of fly ash (14.5 t/ha) with biosolid application (7.7 t/ha) significantly (P<0.05) increased shoot Fe content compared to the control in the first year. Applications of waste mixtures significantly (P<0.05) reduced Mn content of shoot compared to the control in the first year. However, the medium loads of co-applications of fly ash (14.5 and 16 t/ha in the first and second years, respectively) and of lime milk sludge (8.6 and 15 t/ha in the first and second years, respectively) with biosolid (7.7 and 4 t/ha in the first and second years, respectively) significantly (P<0.05) increased plant Mn contents in the second year. Co-applications of fly ash at all rates significantly (P<0.05) increased Zn content of shoots compared to the control in the second year. Co-applications of fly ash and lime milk sludge at medium rates significantly (P<0.05) increased shoot Cu content in the second year. Soil DTPA-extractable Fe in all biosolid mixtures were significantly (P<0.05) higher than the control at the end of the first year. All waste mixtures significantly (P<0.05) increased soil DTPA extractable Zn compared to the control in all three years. Two year co-applications of fly ash or lime milk sludge at medium rates (15 t/ha/y) could be necessary to significantly increase the DTPA-extractable micronutrients in soil. Although high waste application rates increased soil DTPA-extractable elements, they did not increase plant micronutrient content due probably to increased soil salinity after the waste application.

Key words: biosolid, fly ash, lime milk sludge, micronutrients