

Anisotropy of Transport Properties of a Remolded, Compacted Andisol

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Abstract	<p>The transport properties of soil gas and water are known to be anisotropic in undisturbed field samples. However, little is known about the same in remolded samples that resemble the field condition after plowing. Moreover, the effect of added fresh organic matter (OM) on the anisotropy has attracted little attention. In this study, rice (<i>Oryza sativa</i> L.) husks and rice straw were added to a Japanese Andisol. These samples and those with no added fresh OM were remolded and compacted at 225 kPa. The saturated hydraulic conductivity (K-S), relative gas diffusivity [(D-p/D-0)(100)], and air permeability (k(a100)) at -100 hPa matric potential were measured in the vertical and horizontal directions. These values were then used to calculate the specific hydraulic conductivity (S-Ks), specific gas diffusivity (S-D100), and specific air permeability (S-ka100). The vertical (D-p/D-0)(100), k(a100), and K-S values were significantly higher than the horizontal values, suggesting anisotropic gas and water flows. Larger pores were arranged anisotropically based on the higher S-D100, S-ka100, and S-Ks in the vertical than in the horizontal direction. The rice husks improved the horizontal gas flow, and the rice straw impeded the vertical gas flow. Both of these OMs aligned horizontally and improved the horizontal water flow. The results of this study suggest that the anisotropy of the remolded, compacted samples may be different from that of the intact samples. Thus, further studies on a range of soil types using both disturbed and undisturbed samples need to be conducted to test the generality of this result.</p>
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