**Tropentag, October 6-8, 2009, Hamburg**

"Biophysical and Socio-economic Frame Conditions
for the Sustainable Management
of Natural Resources"

# Early Tomato Growth under Soil Aggregate Coalescence

Uswah Hasanah[1], Cameron Grant[2], Robert Murray[3]

[1] *Tadulako University, Soil Science, Indonesia*
[2] *The University of Adelaide, Soil and Land System,*
[3] *The University of Adelaide, Soil and Land System,*

**Abstract**

The phenomenon called soil aggregate coalescence occurs at contact-points between aggregates and causes soil strength to increase to values that can inhibit plant root exploration and thus potential yield. During natural wetting and drying, soil aggregates appear to 'weld' together with little or no increase in dry bulk density. The precise reasons for this phenomenon are not understood, but it has been found to occur even in soils comprised entirely of water stable aggregates. Soil aggregate coalescence has not been widely observed and reported in soil science and yet may pose a significant risk for crops preventing them from achieving their genetic and environmental yield potentials. This project used soil penetrometer resistance to measure the early stages of aggregate coalescence and to evaluate its effects on the early growth of tomato plants. A preliminary evaluation of how the early stages of aggregate coalescence might affect plant growth was attempted using tomatoes as a test plant. Seeds were planted in aggregates of a coarse- or fine-textured soil packed in rings. These were wetted at a rate of 1 $^{mm}/_{h}$ to either near-saturation (maximum coalescence) or to a suction of 10 kPa (minimum coalescence. All samples were then transferred to a ceramic pressure plate for drainage to 100 kPa suction for one week. Samples were then placed in a growth-cabinet held at 20°C with controlled exposure to 14 h light/day. Germination of the seeds, and length of roots were observed. Germination of the seeds held at near-saturation in both coarse- and fine-textured soils was delayed by 24 h compared with seeds held at 10 kPa suction. In the coarse-textured soil, the total root length over a period of 14 days was greater in the un-coalesced samples than in the coalesced samples. These results suggest that aside from delaying germination, aggregate coalescence may not have a large effect on early growth of tomato plants. However, this is not to say that detrimental effects may not be manifest at later stages of plant growth, and this certainly needs to be evaluated, particularly because aggregate coalescence increase with repeated cycles of wetting and draining.

**Keywords:** Aggregate coalescence, tomato, water suction

**Contact Address:** Uswah Hasanah, Tadulako University, Soil Science, Jl. Soekarno-Hatta km 5 Bumi Tadulako Tondo, 94118 Palu, Indonesia, e-mail: uswahmughni@yahoo.co.id