Effects of cover crop residue management on yield and weed control in processing tomato

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Aim: To evaluate the effects of different subsidiary crop species and their residue management on weed control and fruit yield of a tomato crop in the Mediterranean environment of Central Italy

MATERIALS & METHODS

A field experiment was set up in September 2012 at the experimental farm of Tuscia University (UNITUS). A 2-year durum wheat – tomato sequence was adopted. The treatments consisted in:

(i) 4 different cropping sequences (Fig. 1);
(ii) 2 cover crop residue management [residues mowed and left in strips on soil surface in no-tillage (NT) and residues chopped and incorporated into the soil (T)];
(iii) 3 nitrogen fertilization levels to the durum wheat and tomato [0% (N0), 50% (N50), and 100% (N100) of total nitrogen recommended dose].

The experimental design was a split-split-plot, where the main factor was the cropping sequence, the split factor was the cover crop residue management and the split-split factor was the nitrogen fertilization. All plots were replicated four times.

Figure 1. Cropping sequences adopted in the experiment

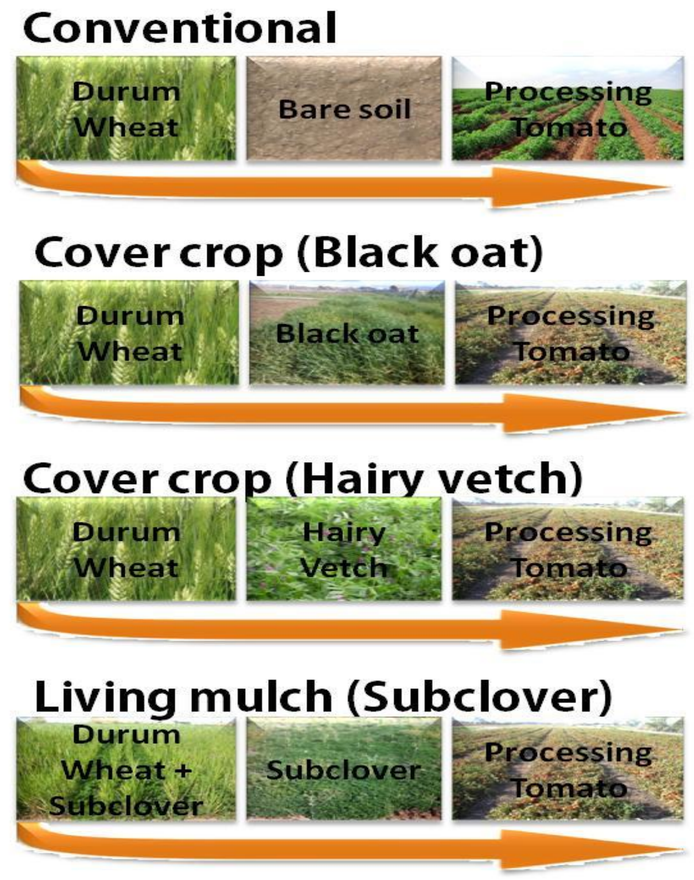
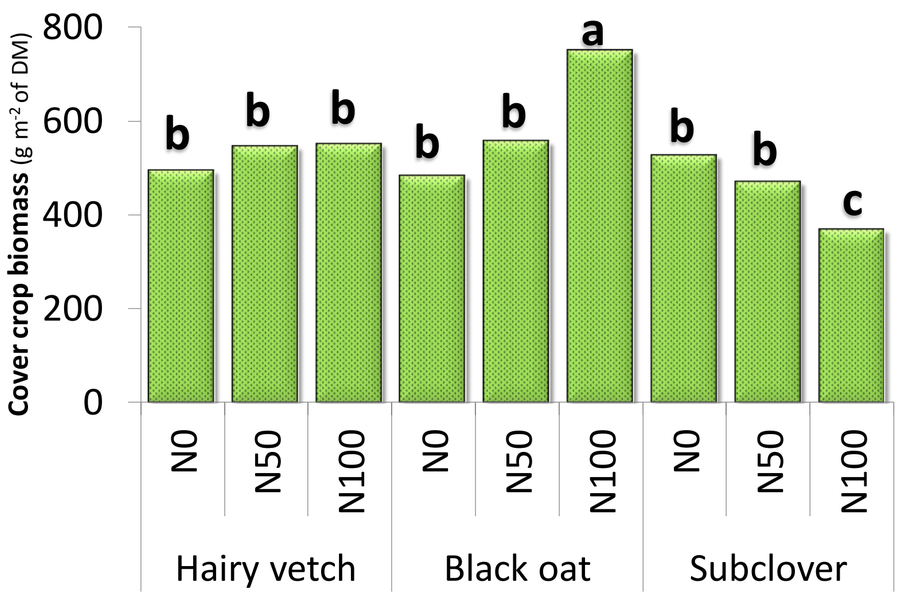


Figure 2. Cover crop aboveground biomass after different nitrogen fertilization levels in wheat. (N0, N50, N 100 = 0, 75, 150 kg N ha^{-1}, respectively). Values belonging to the same character without common letters are statistically different according to LSD (0.05).



RESULTS & CONCLUSIONS

The aboveground biomass of cover crops, collected prior to tomato transplanting (April 2014), was affected by the interaction of cover crop species x nitrogen fertilization in durum wheat (Fig. 2) and ranged from 749 g m^{-2} of DM (black oat N100) to 367 g m^{-2} of DM (subclover N100). In oat the aboveground biomass tended to increase from N0 to N100 fertilization levels, while it was similar in hairy vetch regardless the nitrogen fertilization levels.

In general tomato yielded more in N100 than in N50 and in N0. However, tomato always yielded more following hairy vetch regardless soil tillage, while soil tillage produced a more abundant yield following subclover compared to no-tilled soil. Black oat produced a poor tomato yield even with the administration of high nitrogen level (Fig.3).

Figure 3. The interaction effect of the cropping sequence x cover crop residue management on the marketable tomato yield with N0 = 0 kg N ha^{-1}, N50 = 75 kg N ha^{-1}, and N100 = 150 kg N ha^{-1} nitrogen fertilization levels at tomato harvesting. Values belonging to the same character without common letters are statistically different according to LSD (0.05).

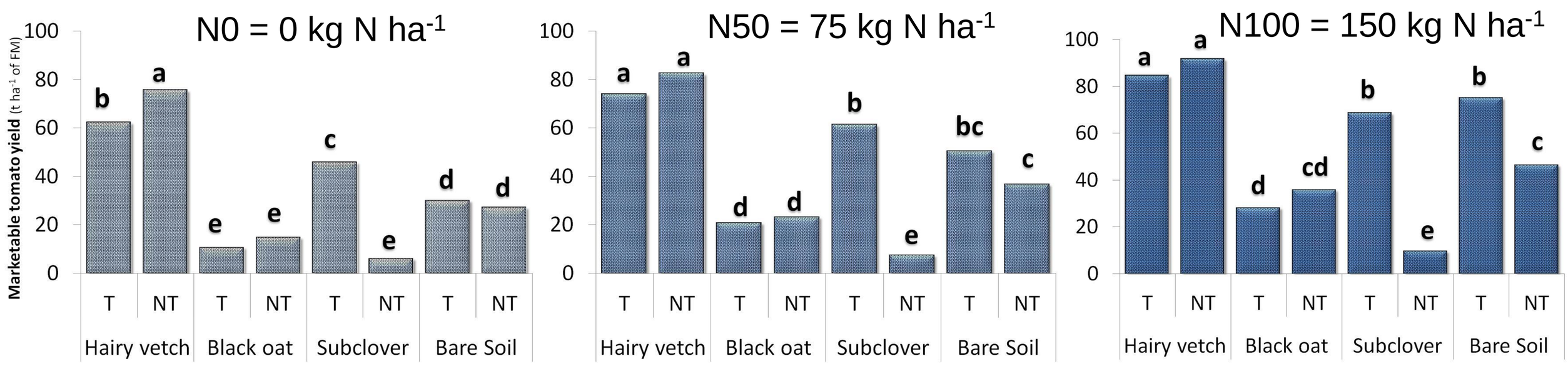
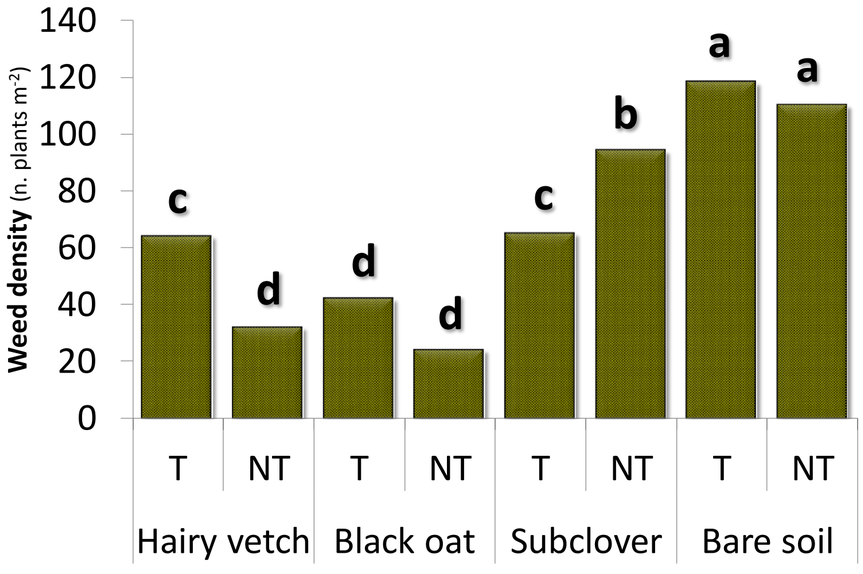


Figure 4. The interaction effect of the cropping sequence x cover crop residue management on weed density at 30 days after tomato transplanting. Values belonging to the same character without common letters are statistically different according to LSD (0.05).



At 30 days after tomato transplanting the weed density ranged from 30 to 120 plants m^{-2} (Fig.4). The highest weed density was observed in bare soil regardless soil tillage, while the lowest weed density was observed in black oat. Following their suppression, grass cover crops typically release allelophatic compounds and immobilize nitrogen thus reducing weed emergence. Low weed density was observed in hairy vetch NT due to the uniform mulch layer, which decreased weed emergence. The large amount of weeds observed in subclover NT, mainly composed of perennial species (i.e. *Rumex c.*, and *Cirsium a.*), probably determined a high level of competition between crop and weeds thus resulting in a low tomato yield.