

The Effect of Dairy Compost Rate on Weed Competition in Potato

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Increased agricultural sustainability in disturbed systems through bio-amendment addition can lead to increases in soil organic matter, increases in productivity, and improvements in soil health. However, organic amendments also increase the growth and competitive ability of weeds when compared to synthetic fertilizer, which may affect weed control and crop yield. A field study was established in 2010 in Entrican, MI to investigate the effect of compost rate on weed competition in potato. Three compost rates (0 kg C ha^{-1} , $4000 \text{ kg C ha}^{-1}$, and $8000 \text{ kg C ha}^{-1}$) were incorporated in late April, and 'Snowden' variety potatoes (*Solanum tuberosum*) were planted mid-May at $2.9 \text{ plants m}^{-1}$ with 0.86 m row spacing. Hairy nightshade (*Solanum physalifolium*), giant foxtail (*Setaria faberi*), or common lambsquarters (*Chenopodium album*) seedlings, 2.5 , 7.5 , or 2.5 cm , respectively, were transplanted into the row at $5.3 \text{ plants m}^{-1}$ at potato cracking. Plant height and biomass were collected and recorded throughout the season. Data was subjected to analysis of variance with significance determined with $\alpha \leq 0.05$. No significant differences in biomass or height were observed within a species due to compost rate differences. Tuber yield and quality were evaluated at harvest, and significant differences were observed in yield from both weed species and compost rate. There was a significant loss in marketable tuber weight and number due to the presence of giant foxtail (24.2 Mg ha^{-1} ; $2.14 \times 10^5 \text{ tubers ha}^{-1}$) or hairy nightshade (24.1 Mg ha^{-1} ; $2.09 \times 10^5 \text{ tubers ha}^{-1}$) when compared to the weed free (31.9 Mg ha^{-1} ; $2.57 \times 10^5 \text{ tubers ha}^{-1}$), and potatoes grown in competition with common lambsquarters yielded less than all other treatments (15.7 Mg ha^{-1} ; $1.41 \times 10^5 \text{ tubers ha}^{-1}$). Total potato yield was also impacted significantly. The weed free treatment had a total potato weight of 35.2 Mg ha^{-1} , giant foxtail and hairy nightshade competition resulted in significant yield reductions compared to the weed free of 20.2 and 20.5% , respectively, and common lambsquarters competition significantly reduced yield by 47.7% . The treatments under giant foxtail competition produced similar total number of tubers to the weed free, $3.04 \times 10^5 \text{ ha}^{-1}$ and $3.31 \times 10^5 \text{ ha}^{-1}$, respectively, but hairy nightshade treatments produced significantly fewer tubers ($2.93 \times 10^5 \text{ ha}^{-1}$) than the weed free, and common lambsquarters treatments produced fewer tubers than all other treatments ($2.02 \times 10^5 \text{ ha}^{-1}$). Compost rate also impacted the number of marketable tubers, where the high compost rate treatments produced significantly more tubers ($2.24 \times 10^5 \text{ ha}^{-1}$) than the low ($1.93 \times 10^5 \text{ ha}^{-1}$) and non-amended treatments ($1.99 \times 10^5 \text{ ha}^{-1}$). Total yield was greatest under the high compost rate treatments (30.0 Mg ha^{-1}), and was significantly greater than the low (26.2 Mg ha^{-1}) and non-amended (26.1 Mg ha^{-1}) treatments. Weed competition decreased marketable and total tuber yield and number, but the degree of reduction was species dependent. There was also an increase in marketable tuber number and total yield at the

highest compost rate. Compost addition may increase marketable tuber production without increasing the competitive ability of the weeds, but this study still demonstrates the importance of weed control in the cropping system. This study will be repeated in 2011.