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Impact of preceding cropping and cutting height on stand uniformity of corn

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Key words: no-tillage, *Zea mays* L., double cropping, planter

Introduction No-tillage (NT) cropping is a promising technique providing potential economic and environmental advantages compared with conventional tillage systems. In Japan, this system has been introduced into the Hokkaido and Tohoku regions (single cropping districts of summer corn) and the Kyushu region (double cropping districts of spring corn and autumn corn), but not into the central areas of the main island (double cropping districts of summer corn and winter crops). The purpose of this study was to evaluate the feasibility of NT cropping in the double cropping system composed of summer corn and winter crops. We attempted to plant corn directly following a winter crop after the first harvest by use of a no-till planter available in Japan. We examined the relationship between the seedling accuracy of the NT planter and the residue of the preceding winter crops.

Materials and methods As the preceding winter crops, Italian ryegrass (*Lolium multiflorum* Lam., IR) and rye (*Secale cereale* L.) were planted in Oct. of 2005. In Apr. of 2006, these crops were harvested as round bale silage with cutting heights of 8 cm (low cutting height treatment) and 20 cm (high cutting height treatment). The aboveground and root biomass of stubble residue were weighed about 2 days after harvesting. Silage corn hybrid XE8915 was planted on 6 June with a John shearer NM-9500 equipped with a disc colter and double disc opener. This NT planter drops corn seeds after the seed slot is formed, and shuts this slot afterwards. Planting was performed with four rows, and the target population was 70,000 plants ha⁻¹. The herbicide nicosulfuron was sprayed right after planting to control regrowth. The number of seeds not covered by soil and the number of seeds deviating from the seed slot were counted. The percentage of corn seedling establishment was recorded by eye measurement in each plot 21 days after planting.

Results and discussion The aboveground biomass of the rye sward was higher than that of the IR sward, but the root biomass was affected conversely. The percentage of inaccurate sowing [missed sowing/total sowing × 100(%)] was higher after the IR sward planting for both no coverage and deviation than after the rye sward planting. As a result, the percentage of seedling establishment after the IR sward planting was significantly lower than that after the rye sward planting. Cutting height did not influence sowing, though it was related to aboveground biomass in each winter forage crop species. It appeared that the root biomass of the IR sward affected the soil physics (data not shown), in turn affecting the accuracy of seed sowing by the NT planter.

Table1 Effect of field condition on accuracy of sowing and establishment.

	Condition of sowing		Biomass of the preceding crop(kgDM/10a)		Inaccurate sowing(%)		Percentage of seedling establishment (%)
	The preceding crop	Cutting height	Above ground	Root	No coverage	Deviation	
No-tillage	Rye	High	407	399	1.4	8.3	45.0 bc
	Rye	Low	229		0.6	1.2	51.2 b
No-tillage	IR	High	276	852	7.5	37.3	26.2 cd
	IR	Low	127		5.2	35.3	23.3 d
Tillage	-	-	-	-	0.0	0.0	85.7 a

Conclusions When the NT planter currently available in Japan was used, rye was a better species to plant in a double cropping system. However, we suspect that other factors contributed to the decreased percentage of seedlings in rye sward. The planter used to cut roots and open seed slots in IR sward needs to be improved, and we need to investigate the factors affecting the percentage of seedlings in rye sward.

Reference

Morita, S., Tsutomu, K., Kurokawa, S., Yoshimura, Y., Senda, T., 2006. Yield and sowing accuracy of summer corn seeded by no-tillage planter after autumn oat. *Japanese Journal of Grassland Science*, 52(Ext.), 294-295 (in Japanese only).