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Durum Wheat Management for a Zero Pesticide Supply Chain

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Introduction

Durum wheat production in Northern Italy highlights a growing interest due to a higher protein and gluten content. In Lombardy, and in the Martesana cereal district, this crop is particularly suitable in relation to the organisation and structure of cereal farms and contractors. Moreover, milling and pasta industries have shown a growing interest in products of territorial origin with a high quality and health profile (**absence of pesticide residues**). This is the background to the experimental activity of FRUDUR-0, a 3-year project financed by FEASR-PSR 2014-2020, Measure 16: "Co-operation", aimed at developing a cultivation protocol for the sustainable intensification of durum wheat production with "zero" residue (< 0.01 mg/kg). Particular attention was paid to weed management and data from the first year of herbicide trials are reported hereinafter.

Materials and Methods

The trials were carried out with a randomized block design on two farms, "La Madonnina" farm, located in Liscate (MI) and characterised by loamy soil and "Mapi" farm, located in Vignate (MI), characterised by a medium-textured soil, where weed control trials were studied. Three management lines, based on different programs of fertilisation and crop protection, were performed:

1. Traditional line (TL) - Adoption of the most common practices with regard to the fertilisation, weed and pathogen control;
2. Advanced line (AL) - Application of selected low-risk substances, according to EC Regulation 1107/2009;
3. Innovative line (IL) - Adoption of biocontrol and anti-stress products, based on microbial consortia.

The untreated plots were only managed by mechanical intervention. With regard to the weed management the following data were evaluated: % herbicide efficacy (compared to weed coverage in untreated plots), total yield, relative humidity, and herbicide residues. The latter were determined in the laboratory using multi-residual LC/MS/MS and GC/MS/MS analytical analysis method UNI EN 15662:2018, LOQ 0.01 mg/kg.

Results

The first year of the trials was characterised by very late sowings and frequent and abundant spring rains (501 mm). Therefore, yields were rather low and did not show significant differences among treatments.
In both years the main weeds were *Poa annua* – POANN (11% average coverage), at the "La Madonnina" farm and *Stellaria media* – STEME (15% average coverage), at the "Mapi" farm.
P. annua was well controlled by the mixture of 0.75 L/ha Axial Pronto (Pinoxaden 60 g/L) + 2.5 L/ha Manta Gold (Clopyralid 23.4 g/L + Fluroxipir 86.5 g/L + MCPA 416.1 g/L) in post-emergence with herbicide efficacy values statistically higher than those of the innovative line of 0.75 L/ha of Zypar (Florasulam 5 g/L + Halauxifen methyl 6.3 g/L) followed by mechanical intervention with spring tine harrow; *S. media* always had 100% control in both weed programs.
It is worth noting that in treated plots of all the 6 herbicides used only Clopyralid showed residues in wheat grain above the threshold of 0.01 mg/kg.

		"La Madonnina" farm			"Mapi" Farm		
Line	**Herbicide**	**POAAN %**	**t/ha 13%**	**A.S. (LOQ) > 0.01 mg/kg**	**STEME %**	**t/ha 13%**	**A.S. (LOQ) > 0.01 mg/kg**
TL -AL	Pinoxaden + Clopyralid + Fluroxipir + MCPA	91.3 a	4.2 a	Clopyralid 0.08	100 a	4.6 a	Clopyralid 0.02
IL	Florasulam + Halauxifen methyl + Spring tine harrow	83.3 b	4.1 a		100 a	4.7 a	
No treatment	Spring tine harrow	-	4.1 a		-	4.6 a	

Conclusions

All the experimental tests carried out in 2019-20 for the 3 compared lines, showed residue below the threshold of 0.01 mg/kg, with the exception of the herbicide Clopyralid. These results highlights the necessity to test herbicide residues on the unprocessed grains and to set up updated crop guidelines in order to ensure a content of pesticide residues in the end-products below the threshold set for organic products.

FILIERA DEL GRANO DURO A RESIDUO ZERO DELLA MARTESANA

Fondo Europeo Agricolo per lo Sviluppo Rurale: l'Europa investe nelle zone rurali

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