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Leaf senescence of spring wheat in contrasting agroecosystems

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INTRODUCTION

The aim was to evaluate the influence of soil tillage and nitrogen application in combination with crop residues on leaf senescence of spring wheat.

Field trial design:

Tillage (A factor)		
	Primary tillage	Presowing tillage
CT–conventional tillage	Stubble cultivation (10-12 cm) + ploughing (23-25 cm)	Spring tine cultivation (4-5 cm)
RT-reduced tillage	Stubble cultivation (10-12 cm) + Glyphosate (3 l ha^{-1})	Spring tine cultivation (4-5 cm)
NT – no tillage	Glyphosate (3 l ha^{-1})	Direct drilling
Fertilization (B factor)		
1	No fertilized	
2	Moderate NPK rates according to soil properties and expected yield (Mod NPK)	
3	High rates (NPK fertilizers according to soil properties and for 30% greater expected yield than in 2nd treatment) (H NPK)	
Residues (C factor)		
1	Residues removed	
2	Residues returned	

MATERIAL AND METHODS

Measurements of physiological indices:

•The senescence of leaves. SPAD and Fv/Fm were evaluated in 1st, 2nd and 3rd leaves from the top, on background with residue, under NT and CT. Data was collected during generative development stages - at BBCH 67-69, BBCH 71-73, BBCH 75 in spring wheat

•Chlorophyll index (SPAD) was measured using a chlorophyll meter Minolta SPAD 502.

•The maximum quantum efficiency of PSII (Fv/Fm) was measured *in vivo* using a pulse modulated handheld chlorophyll fluorometer (model OS-30p).

RESULTS

NT reduced SPAD in 1st, 2nd and 3rd leaves in most of cases, in comparison to CT between measurements. The fertilization postponed senescence in terms of both SPAD and Fv/Fm, especially in flag leaf at grain filling stage.

The correlation coefficients between grain yield (GY), quality indices and NDF, ND SPAD varied with different growth stages, leaf positions and tillage methods. At BBCH 67-69, the relationship between ND SPAD 1/2 and GY was significant under CT ($r = -0.704$, $P \leq 0.05$). ND SPAD 1/2 explained 50% of GY variation under CT and considerably less - only 14% - under NT. The correlation coefficients for ND SPAD 1/3 and ND SPAD 2/3 with GY were the most significant and stronger ($r = -0.934$ and 0.913, respectively, $P \leq 0.01$) under NT than CT; ND SPAD 1/3 and ND SPAD 2/3 were responsible for 87 and 83% of GY variation. The relationship of NDF 1/3 and NDF 2/3 with GY, conversely, was stronger ($r = -0.871$ and 0.860, respectively, $P \leq 0.01$) under CT than NT.

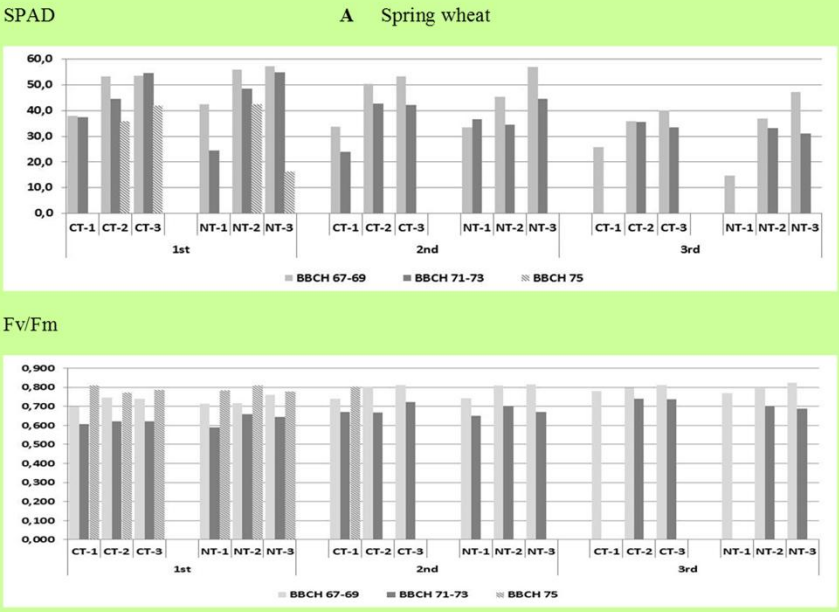

Figure. Senescence dynamics of spring wheat under CT and NT at the final growth stages. 1st , 2nd, 3rd – first, second and third leaf from top, respectively.

CONCLUSIONS

- In spring wheat, the simplification of tillage resulted in faster senescence of the leaves, NT reduced SPAD in 1st, 2nd and 3rd leaves in most of cases.
- Fertilization postponed senescence in terms of both SPAD and Fv/Fm in spring wheat .