

Wheat rusts monitoring in Tuscany: re-emergence of stem rust on both durum and common wheat varieties

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INTRODUCTION:

Wheat diseases monitoring has been carried out in Tuscany (Arezzo, Firenze and Grosseto province) since 2013 through a collaboration agreement between the Regional Phytosanitary Service and the University of Florence (DAGRI). The purpose of monitoring is to alert farmers in time to prevent wheat diseases and reduce pesticides applications. The alert system is available online from April to June, data are weekly updated on <http://agroambiente.info.regione.toscana.it>. The varieties of wheat chosen in 2021 were both cultivated in experimental trials or in farm lands, both ancient and modern varieties of durum and bread wheat, with organic and/or integrated management. Although wheat stem rust, caused by *Puccinia graminis* f. sp. *tritici*, was eradicated in Western Europe during the last half of twentieth century by breeders’ work, in the second decade of the new millennium an outbreak occurred in middle Europe, especially in Germany and with sporadic infections in Denmark, Sweden and UK. Only in 2016, an epidemic outbreak was recorded in Sicily and after 2 years also in Tuscany, initially only on some cultivars with low incidence and low severity.

Occurrence of rusts detected by province during the 2021 season.

DISEASE	PROVINCE	April				May				June			
		I ^a	II ^a	III ^a	IV ^a	I ^a	II ^a	III ^a	IV ^a	I ^a	II ^a	III ^a	IV ^a
STRIPE RUST	Firenze												
	Arezzo												
	Grosseto												
LEAF RUST	Firenze												
	Arezzo												
	Grosseto												
STEM RUST	Firenze												
	Arezzo												
	Grosseto												

Severity of stem rust detected by varieties during the 2021 season.

LOCALITY	PROVINCE	WHEAT VARIETIES	SPECIES	STEM RUST SEVERITY								
				1	3	5	7	9				
FIRENZE	FI	Michelangelo	<i>T. aestivum</i>									
SAN CASCIANO		Mix Gentil Rosso - Andriolo	<i>T. aestivum</i>									
FORNACETTE		Mix Gentil Rosso - Andriolo	<i>T. aestivum</i>									
BRUSCIANA		Andriolo	<i>T. aestivum</i>									
CASTELFIORENTINO		Gentil Rosso	<i>T. aestivum</i>									
CESA	AR	Claudio	<i>T. turgidum ssp durum</i>									
		Iride	<i>T. turgidum ssp durum</i>									
		Marco Aurelio	<i>T. turgidum ssp durum</i>									
		Monastir	<i>T. turgidum ssp durum</i>									
		Odisseo	<i>T. turgidum ssp durum</i>									
		Tito Flavio	<i>T. turgidum ssp durum</i>									
		Albagran	<i>T. aestivum</i>									
		Bologna	<i>T. aestivum</i>									
		Bramante	<i>T. aestivum</i>									
		Lancillotto	<i>T. aestivum</i>									
		Rebelde	<i>T. aestivum</i>									
		Solehio	<i>T. aestivum</i>									
BRACCAGNI	GR	Iride	<i>T. turgidum ssp durum</i>									
		Marco Aurelio	<i>T. turgidum ssp durum</i>									
		Odisseo	<i>T. turgidum ssp durum</i>									
		Tito Flavio	<i>T. turgidum ssp durum</i>									
		Albagran	<i>T. aestivum</i>									
		Bologna	<i>T. aestivum</i>									
		Bramante	<i>T. aestivum</i>									
		Lancillotto	<i>T. aestivum</i>									
		Rebelde	<i>T. aestivum</i>									
CAPALBIO	GR	Solehio	<i>T. aestivum</i>									
		Claudio	<i>T. turgidum ssp durum</i>									
		Iride	<i>T. turgidum ssp durum</i>									
		Marco Aurelio	<i>T. turgidum ssp durum</i>									
		Monastir	<i>T. turgidum ssp durum</i>									
		Odisseo	<i>T. turgidum ssp durum</i>									
		Tito Flavio	<i>T. turgidum ssp durum</i>									
		Albagran	<i>T. aestivum</i>									
		Bologna	<i>T. aestivum</i>									
		Bramante	<i>T. aestivum</i>									
		Lancillotto	<i>T. aestivum</i>									
		Rebelde	<i>T. aestivum</i>									

RUSTWATCH PROJECT:

In 2020 DAGRI started a collaboration with the project RustWatch, a consortium of researchers led by the Global Rust Reference Center (GRRC) at Aarhus University (Denmark), to contribute setting up an early-warning system of wheat rusts by monitoring and sampling wheat varieties. For this purpose some varieties were sown both in Tuscany and Sicily 1) to follow the appearance of rust symptoms in different climatic and soil conditions 2) to evaluate the perspectives of an early warning system coordinated between Sicily and Tuscany, https://biagio.shinyapps.io/Early_Warning_Tuscany/, and 3) to assess the races present on the same varieties in so different region. Samples from 2021 were sent to GRRC to be identified by SSR genotyping and by race analysis. Data including monitoring activities are available on RustWatch website <https://agro.au.dk/forskning/projekter/rustwatch/>. Results from 2020 showed that **two races were detected** in Tuscany: **TTRTF** and **TKKTF**.



Average minimum and maximum temperatures and monthly rainfall recorded during the 2020-2021 cereal season.

Month	Metereological data	Weather stations		
		Firenze	Arezzo	Grosseto
November	Average min and max temperature (C°)	8.2 – 16.0	5.1 – 15.1	3.1 – 16.0
	Rainfall (mm)	26.2	13.6	30.2
December	Average min and max temperature (C°)	5.0 – 11.2	2.7 – 10.7	6.3 – 14.4
	Rainfall (mm)	160.6	149.6	112.0
January	Average min and max temperature (C°)	2.9 – 9.5	0.8 – 8.7	4.2 – 12.0
	Rainfall (mm)	128.4	121.0	89.6
February	Average min and max temperature (C°)	5.3 – 14.0	1.4 – 14.0	5.8 – 15.1
	Rainfall (mm)	73.2	51.6	22.4
March	Average min and max temperature (C°)	4.4 – 16.6	0.1 – 15.4	5.3 – 16.4
	Rainfall (mm)	4.2	5.2	10.4
April	Average min and max temperature (C°)	7.3 – 18.0	3.6 – 17.0	7.6 – 17.6
	Rainfall (mm)	63.8	54.6	23.8
May	Average min and max temperature (C°)	11.9 – 22.9	7.9 – 22.2	12.1 – 22.7
	Rainfall (mm)	62.6	27.6	13.4
June	Average min and max temperature (C°)	17.8 – 30.7	13.3 – 30.1	17.4 – 29.0
	Rainfall (mm)	18.6	39.6	8.2

Incidence of stem rust between varieties detected by province during the 2021 season.



OBSERVATIONS AND RESULTS:

Weather: Winter was characterized by a dry November with temperatures above the average for this period. December recorded high amount of precipitation. January was exceptionally rainy, temperatures substantially in line with the average. The rains observed in February were in line with the average of the last 30 years. The temperature trend in February was characterized by values slightly above average in the first half, then, in the middle of the month it was witnessed a brief but intense cold wave. March was exceptionally dry, with temperatures below the average for almost the entire month. During April and May rains in line with the average, while the temperatures were below the average. The rains observed in June were lower than normal, while the temperatures were above the average of last 30 years.

Onset of symptoms: almost all the cultivars monitored showed stem rust symptoms with an incidence ranging from 5% to 100%. Symptoms of stem rust first appeared in the south of the region. Varieties sown early in the province of Grosseto, who reached full maturation early, also because of the higher temperatures in this part of the region, showed lower incidence compared with other varieties. The advanced phenological stage and the senescence of the tissues upon arrival of the infection can explain this finding. Varieties sown late in the season, in Arezzo province, showed in fact the higher incidence by varieties. Bramante seemed to be the more susceptible between the monitored varieties.