



ULST Timisoara
Multidisciplinary Conference on Sustainable Development
 21-22 May 2026



A GRAPHICAL METHOD FOR PREDICTING ONION MAJOR PESTS ATTACKS

Daniel Kazimir KURZELUK

Research-Development Institute for Plant Protection Bucharest

e-mail: kurzelukdaniel@yahoo.com

Abstract: The long-term climatic data (monthly temperatures and precipitations) gathered for the last 50 years have been gathered and compared with recent climatic changes averages. The analysis of the climatic data compared to the development cycle duration in three major onion pests - *Delia antiqua* (Meigen, 1826) (Diptera: Anthomyiidae), *Frankliniella occidentalis* Pergande, 1895 and *Thrips tabaci* Lindeman, 1889 (Thysanoptera: Thripidae) - revealed potential changes in environmental conditions relevant to the pests' development. The results showed a gradual increase in mean temperatures and modifications in precipitation patterns in south-eastern Romania over the studied interval. These changes may influence the duration and seasonal timing of the pests' developmental cycle and could affect their population dynamics and potential spread under current climatic conditions. The correlation between the climatic data and the development conditions of the pests have been analysed, and the obtained results have been used in order to develop a simple graphical method of evaluation of the pests' attack risk in the field

• Introduction

According to the available data, the major onion pests in Romania can develop multiple generations in a year, from the first half of March until the first half of September;

The current climate changes (more and more noticeable in the last years) let to the modification of the median monthly temperatures and precipitations, which affected progressively the pests' life cycles;

Even so, their biological development constants can both favourize and - most important - in relation to the abiotic factors (e.g. temperature and humidity) can become an impediment also for the pests' development, as observed at least in the last two years;

Due to the lower temperatures recorded in March-April, the pests' spring emergence is delayed, and of the summer months temperatures higher values (July-August), the development cycles are affected to the point that as in July the temperature superior threshold being exceeded, the pests, rate of survival can drop substantially.

• Material and method

In order to assess the potential limits and temporal extent of the pests' developmental cycles, those data have been correlated with the abiotic factors' values in the studied region in the range 1950 - 2024, both recorded and from the literature;

Long-term climatic data (mean values of temperature and precipitation recorded over the last 50 years) were compared with current averages in order to find the amplitude of the climatic modifications for the studied zone (South-Eastern Romania);

In order to assess the potential limits and temporal extent of the pests' developmental cycles, those data have been correlated with the abiotic factors' values in the studied region in the range 1950 - 2024, both recorded and from the literature;

A series of mathematical equations based primarily on the development cycle length in relation to the abiotic factors, from which the most important is the temperature, as the insects are poikilotherm - and thus the most impactful - have been applied to those data, resulting in the delimitation of the ecological zones of development;

Comparing those historical data with the mean values of temperature and precipitations from 2024, a notable difference was observed, as the mean temperature values raised and the precipitation regime altered;

By plotting those data against the ecological zones of development, it was observed that the raising temperatures may affect the development cycle of *D. antiqua*, *F. occidentalis* and *T. tabaci*, at least in theory and in the studied area.

By plotting those data against the ecological zones of development, it was observed that the raising temperatures may affect the development cycle of *D. antiqua*, *F. occidentalis* and *T. tabaci*, at least in theory and in the studied area.

• Results and discussions

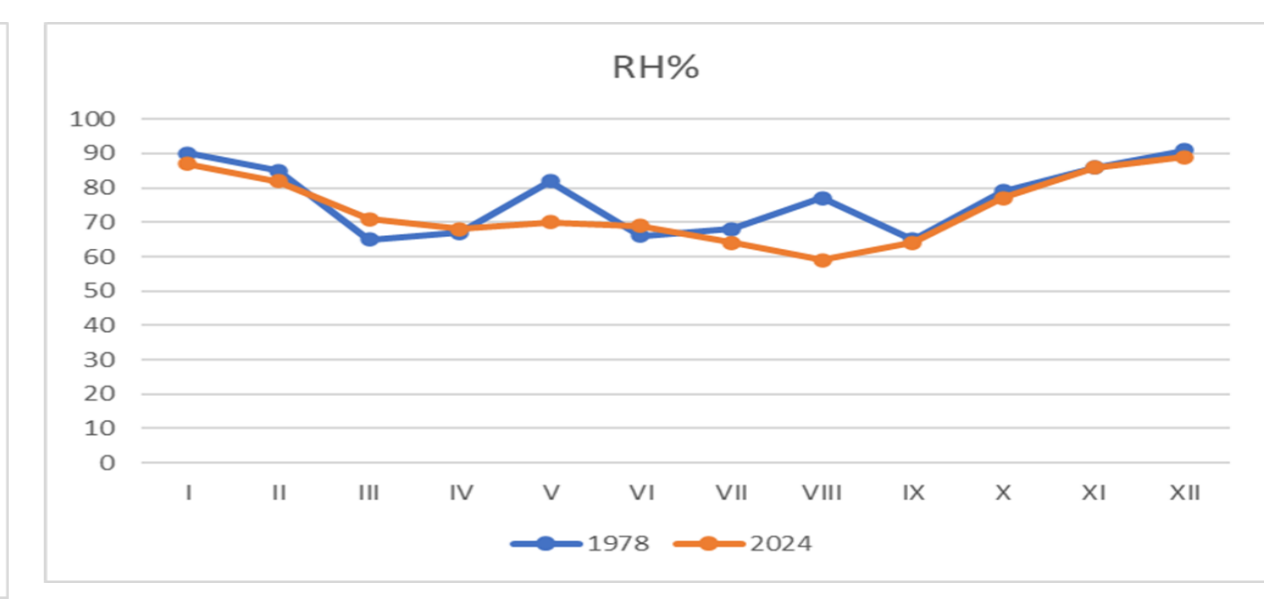
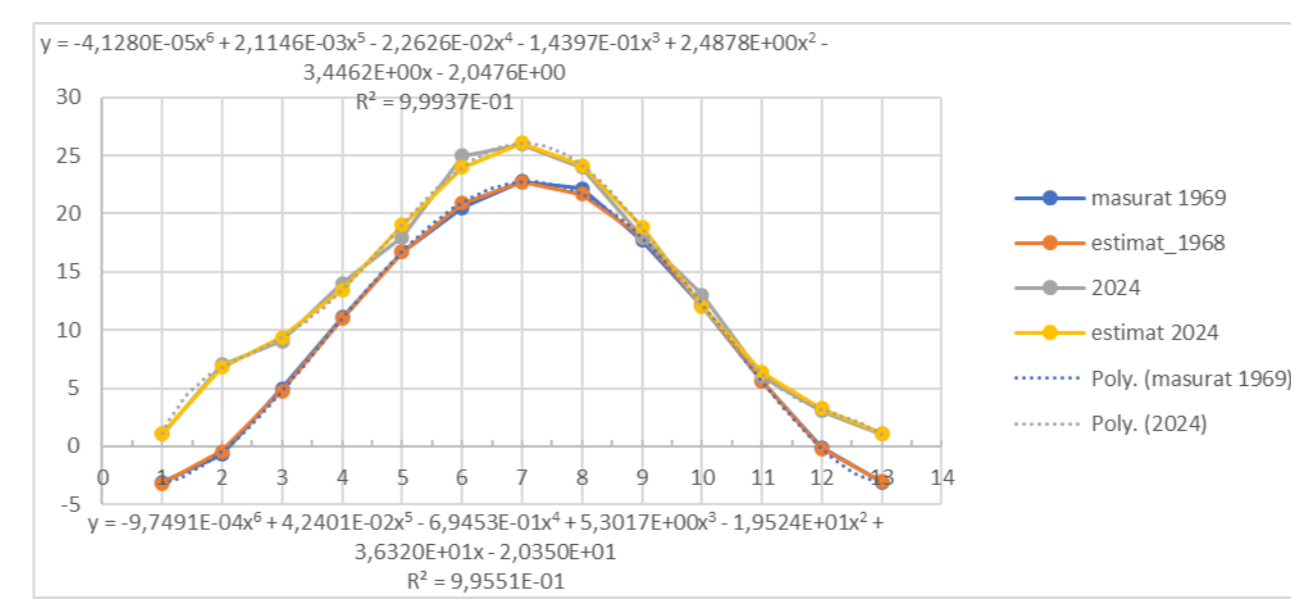
The analysis suggests that the life cycle of the major onion pests in Romania may have been altered under the current climatic conditions;

Their biological requirements continue to favor development and spread in areas where temperature and humidity approximate those of their optimum-to-subfavourable (pessimum) development range, but changes in climate variables may influence their seasonal dynamics;

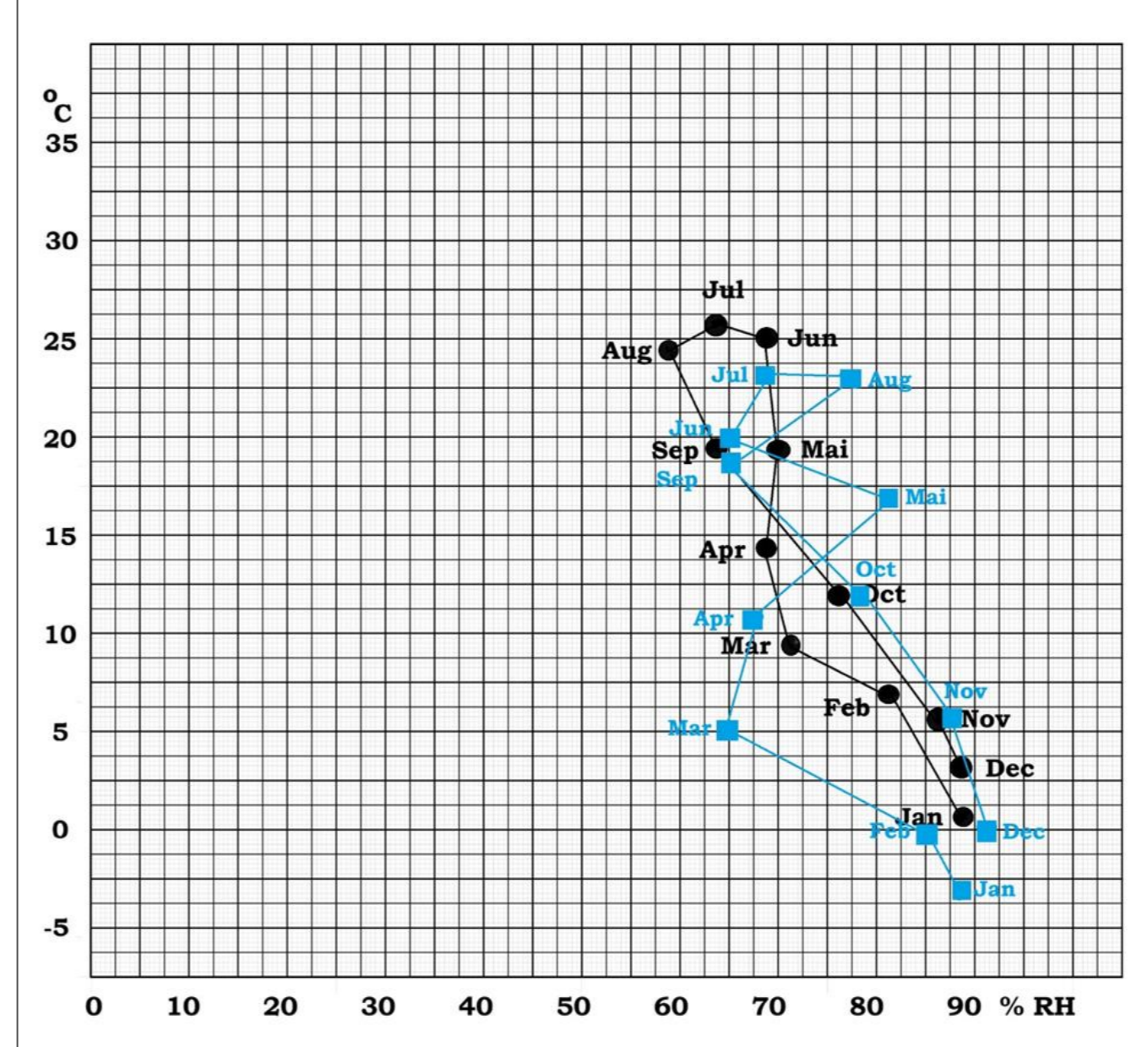
Thus, it may be possible for the life cycle to be perturbed, in the spring months and in the autumn months, if the temperature values are inferior to the sub-favourable zone;

Also, temperature values higher than the favourable zone in the summer may affect or even interrupt the development cycle.

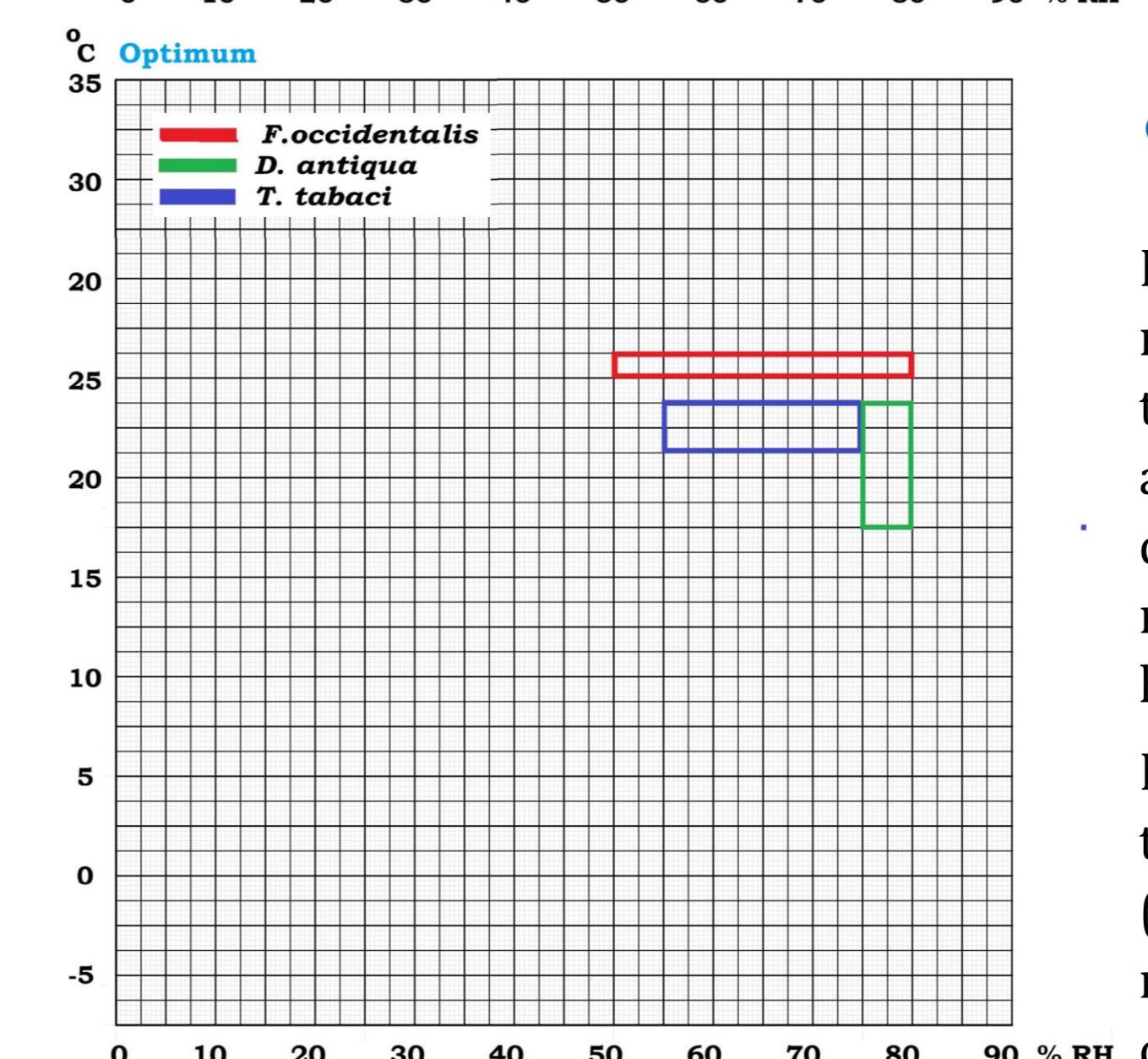
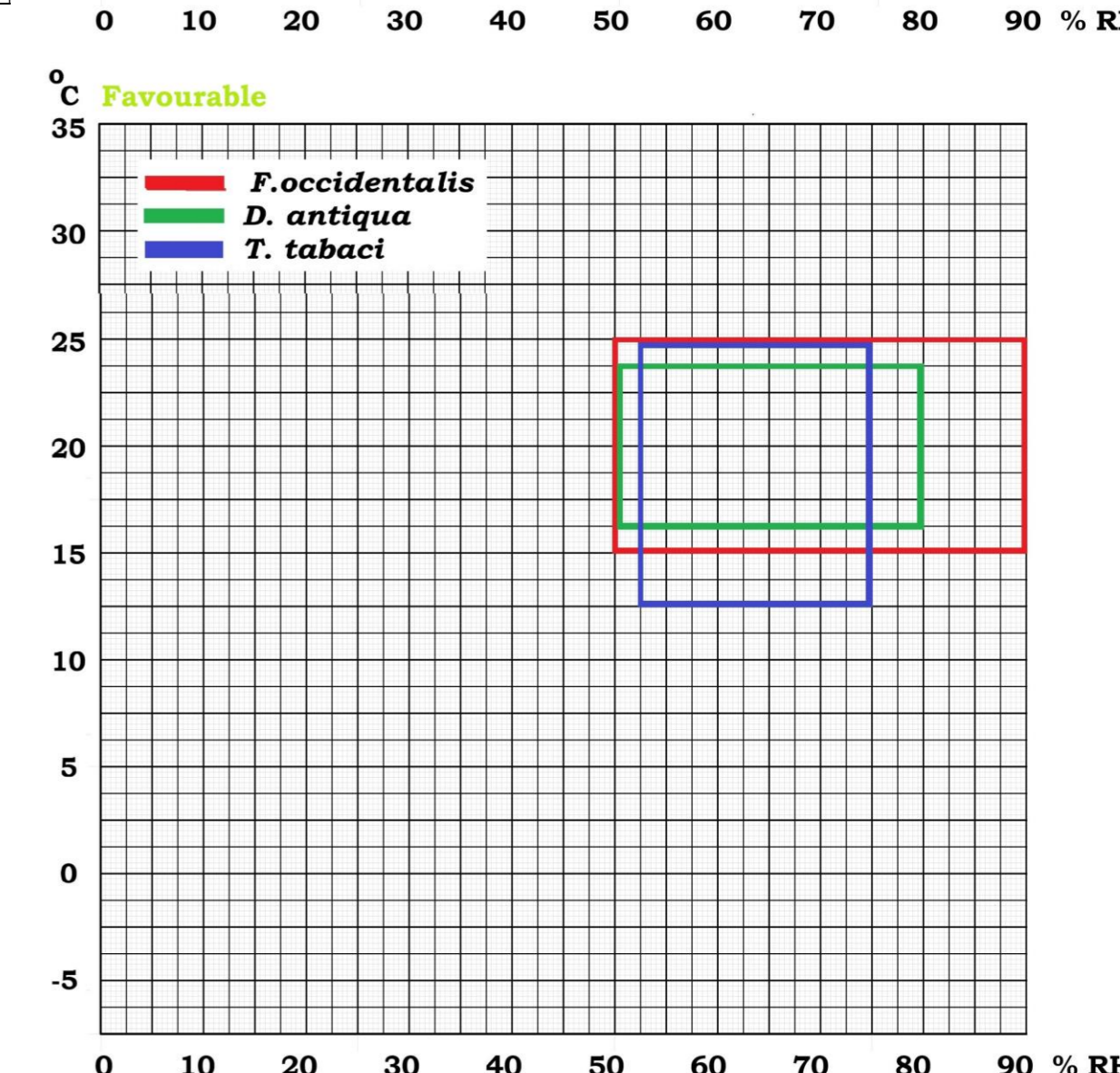
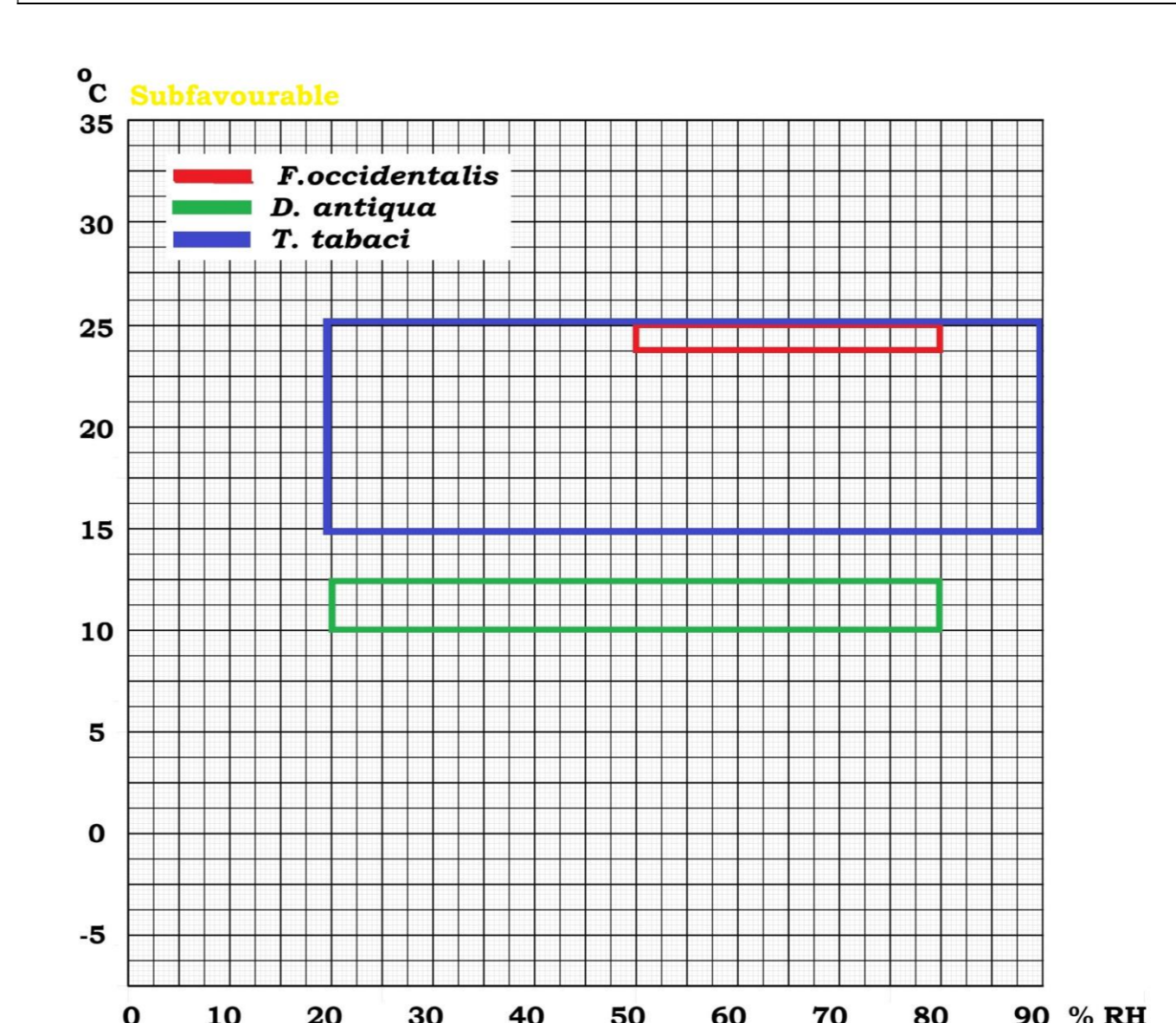
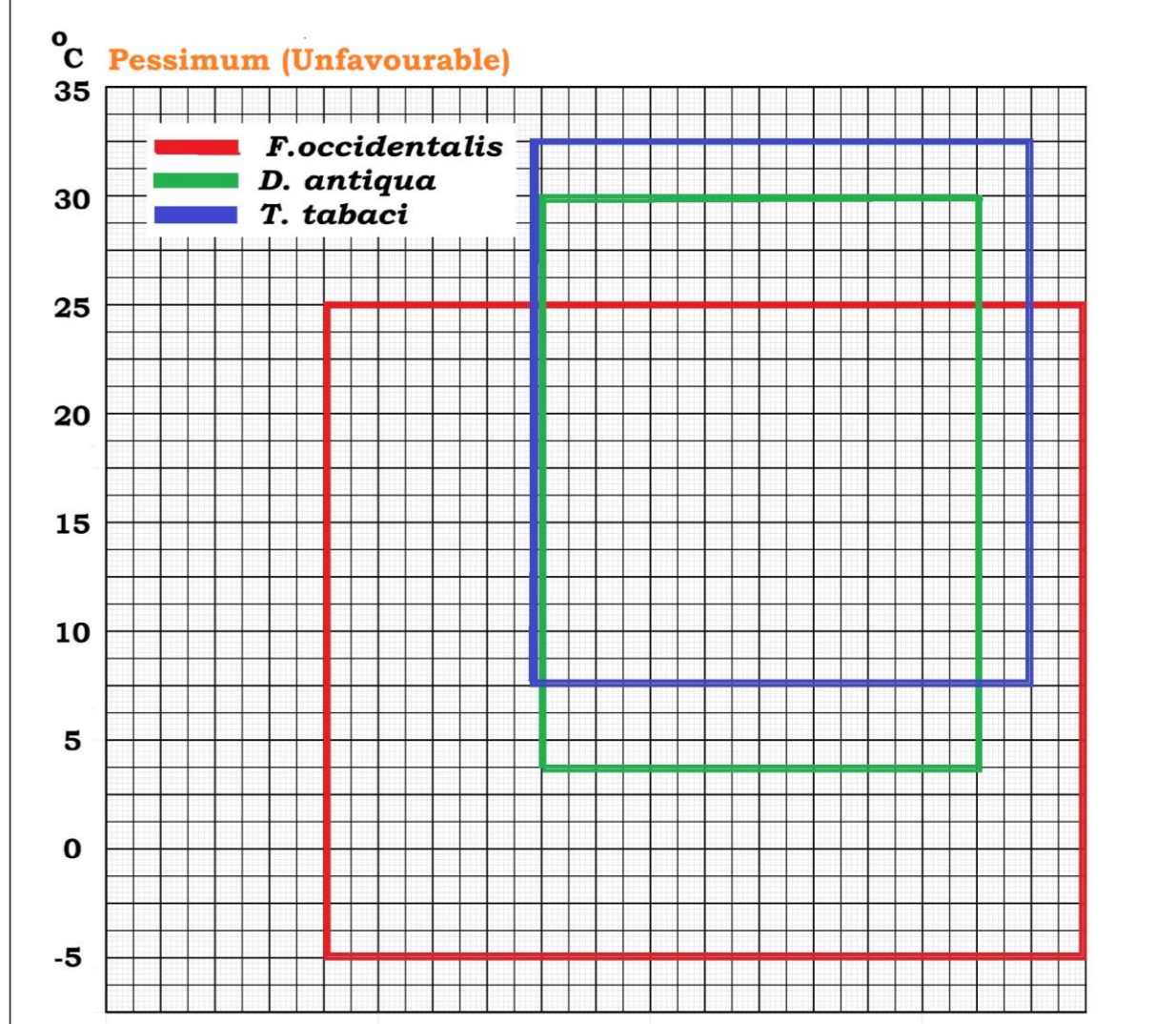
The evolution of the monthly humidities and temperatures												
RH%	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1978	90	85	65	67	82	66	68	77	65	79	86	91
2024	87	82	71	68	70	69	64	59	64	77	86	89
1978	-3	0	5	11	17	20.05	23	22	18	12	6	0
2024	2	7	9	14	18	25	26	24	19	13	6	3.05



The evolution of the Bucharest zone local clima from 1969 (black dots) to 2024 (blue dots)



Development zones	<i>D. antiqua</i>		<i>F. occidentalis</i>		<i>T. tabaci</i>	
	T°C	RH%	T°C	RH%	T°C	RH%
Deadly	<4 ->30	<40 ->80	<-5 ->26,5	<20 ->90	<7 ->32	<39 ->48
Pessimum	4 - 30	40 - 80	-5 - 26,5	20 - 90	7 - 32	48 - 55
Subfavourable	24 - 25	50 - 80	15 - 25	20 - 90	10 - 12	20 - 90
Favourable	17 - 24	50 - 80	15 - 25	50 - 90	12 - 25	55 - 75
Optimum	18 - 24	75 - 80	25 - 26,3	50 - 80	22 - 25	55 - 75



• Conclusions

In the field, the environmental modifications may have dual implications: negative, due to the pests' impact on host plants, or positive, as delayed emergence and reduced development - caused by the colder spring, respective hotter summer months - could hinder or even suppress population growth;

In protected spaces, in which the temperature and humidity are not controlled (higher values than in the field), the summer months can be unfavourable to the pest development;

In protected spaces with controlled conditions (values close to the biological ones), the pest may be little, if not affected;

All those dynamics can work only in the absence of chemical, biological or integrated control methods.

Acknowledgements

The author thanks to the colleague Ph.D. Eng. Ciprian Florea for assistance with the calculations.