RESEARCH ON PHYTOSANITARY PROTECTION OF COWPEA CROP UNDER PSAMOSOILS IN SOUTHERN OLTENIA

*Reta Drăghici**

Research and Development Center for Plant Growing on Sands Dăbuleni

*correspondence address:
Research and Development Center for Plant Growing on Sands,
207220 Dăbuleni-Dolj, Romania,
Phone: +40251334402 / +40251334347,
e-mail: retadraghici@yahoo.com

Abstract: Researches were performed during 2012-2014 , under psamosoils in southern Oltenia and had pursued the prevention and combating of pest attack produced by agents from the cowpea culture . The results obtained reveals very good efficacy of the product Topsin 500 SC at a concentration of 0.07% in combating Virus cowpea aphid borne (G = 2%) and of the product Shavit F72 WP at a concentration of 0.2%, in combating Pseudomonas syringae pv pathogens. Vignae (Ga = 15.3%) and Uromyces appendiculatus (Ga = 17.3%). Treatment with Calypso EC 480 in a dose of 80 ml / ha, has recorded the lowest frequency of pest attack Aphis fabae (F = 16.6%) and Acanthoscelides obtectus (F = 19.1%). Performing of two phytosanitary treatment at cowpea with Topsin 500 SC in a concentration of 0.07% + Calypso EC 480 at a dose of 80 ml / ha, in phases 3-4 true leaves and flowering plant, has led obtaining the best production results (2750.7 kg / ha).

***Keywords**: pathogens, pests, treatment, production*

INTRODUCTION

Cowpea (*Vigna unguiculata* L. Walp) is considered one of the most resistant to drought leguminous plants, cultivated widely in sub-Saharan Africa, Asia and in some parts of America, considered an important food and culture forage successfully used in animal feed. (Hearne & Franco-Duran, 2010). The results obtained in Nigeria by Ishiyaku and Aliyu (2013) revealed correlations between drought resistance of certain cowpea genotypes and selection of new sources of genes for Striga and aphid resistance (*Aphid craccivora*). Also, it has been established positive correlations between seed size of cowpea and the degree of weevil attack (Lephale et al, 2012). Research carried out by Petcu et al., 2007, showed a strong correlation between microclimate, biological material and technological factors, as to modify the physiological and biochemical processes involved in the plant response to stress conditions. The area of sandy soils from southern Oltenia is characterized by a zone with peculiarities specific ecologically, which significantly influence the spectrum and evolution of harmful and useful organisms to agricultural crops (Cojocaru et al., 1989, 1996).

The results obtained in some plants grown in these soils (peanuts, cowpea) showed that, frequently, the climatic conditions at the level plant can be modified compared to the data of weather stations, significantly influencing the infection and the degree of attack by pesting agents plant (Oprea & Cojocaru, 1998; Draghici et al., 2014).

MATERIALS AND METHODS

The research was conducted during 2012-2014 to CCDCPN Dabuleni at cowpea crop under irrigation conditions placed on psamosoil with a low natural fertility (0.4-0.6% humus). Experience has been placed after the subdivided parcels method with two factors (Factor A-fungicides, with the graduations: untreated, Dithane M-45-0.2%, Shavit F72WP-0.2%, Topsin

500SC - 0.07% and Factor B - insecticides, with graduations: untreated, Faster 10CE - 0.03%, Confidor Energy - 0.1%, Calypso 480CE - 80ml/ha). *Ofelia* cowpea variety it was sown in a crop rotation: rye, sorghum, cowpea, located approx. 100 m curtain of acacia, and phytosanitary treatments were performed in growth, as follows: first treatment was applied in phase 3-4 true leaves and second treatment was applied during blossoming. In the 16 experimental variants have been identified the pests and pathogens in the culture of cowpea and it has been established attack implication in physiology and plant productivity. The determination and observations relating of attack frequency (F%), and the degree of attack (Ga%) of pests were performed at 10 days after treatment. The results were analysed using ANOVA and mathematical functions.

RESULTS AND DISCUSSIONS

In May-August period 2012-2014 (calendar period cycle of vegetation cowpea genotypes) were recorded on average 22.07°C, with 1.12°C more than the annual average (Table 1).

Table 1. Climatic conditions during the growing season to cowpea (Dabuleni CCDCPN weather station)

Climate elements	2012-2014				May-August	
	May	June	July	August	Interval average / min. /max.	Amount
Average air temperature (^{o}C) (2012-2014)	17.9	22.0	24.4	24.0	22.07	$\sum^{o}$C = 2586.7-2803.9 $\sum^{o}$C > 10 = 1356.71696.9
Minimum air temperature (^{o}C) (2012-2014)	6.3-7.9	9.8-11.0	11.4- 12.5	6.5-13.3	6.3-13.3	
Maximum air temperature (^{o}C) (2012-2014)	30.2-32.5	33.7-37.8	34.9-41.4	36.5-42.6	30.2-42.6	
Rainfall (mm) (2012-2014)	90.7	76.53	56.7	22.9	x	246.83
Relative humidity (%) (2012-2014)	74.8	72.9	66.4	64.3	70.4	x
Multiannual average air temperature (^{o}C) (1956-2013)	16.75	21.61	23.1	22.36	20.95	x
Rainfall multiannual (mm) (1956-2013)	60.61	68.05	53.0	38.07	x	219.74

Compared to the annual average, while in the period from May to August there were recorded 219.74 mm rainfall, during the study period these totalled 246.83 mm, exceeding by 11.23% annual average. The amount of rainfall recorded in May (90.7 mm), was sufficient for imbibing seed to trigger the germination process. Sum of degrees of temperature recorded during the growing cowpea season was in the range of 2586.7 to 2803.9°C, of which 1356.7 to 1696.9°C were biologically active (>10°C), allowing the normal development processes of plant growth and development. The fungal diseases and various pests affecting plants in different ways and may manifest at any growth stage of the crop. The early infections and those occurring to mid-season are usually foliar diseases that cause lesions on leaves and stems. Through damage leaves, is reduced surface for photosynthesis, which means it cannot produce enough plant nutrients to support optimal growth of plants (Petcu et al., 2007).

Results for growing bean plants emphasized symptoms of plant infection with virus cowpea aphid borne as from 3-4 true leaf stage. The attack has manifested in terms of leaf mosaic, deformation and reduction of leaf lamina, with bushy plants and remaining low. The attack degree by virus cowpea aphid borne to the culture of cowpea had values between 0 and 8.09%, being negatively correlated, significantly distinct with daily photosynthesis rate (r = - 0.875 **), figure 1.

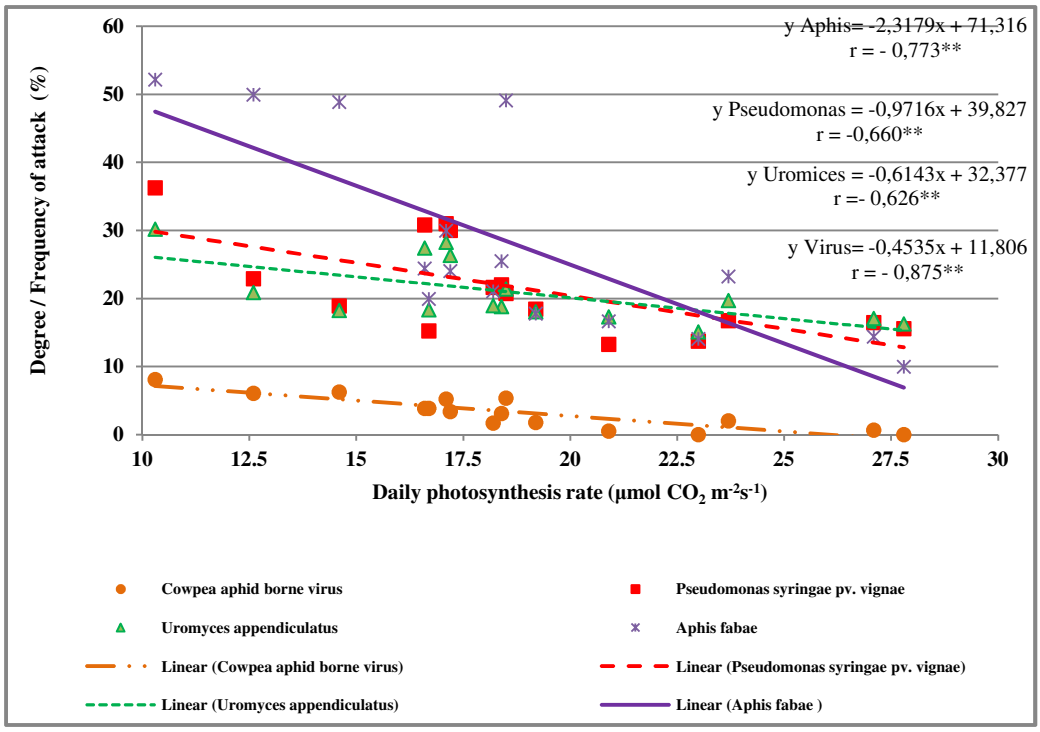

Figure 1. Correlations between the pests attack and photosynthesis rate (daily average) registered at cowpea

Against the background of average temperatures of 17.9 to 22.0°C with maximum 30.2-32.5°C associated with relative air humidity created especially by irrigation, starting with the second decade of May and, they made favorable conditions for the development of bacteria infection caused by *Pseudomonas syringae* pv. vignae, as from the phase of the cotyledons, in the form of yellow-brown small spots. The infection was maintained during June when climatic conditions (average temperatures and rainfall 22.0°C summed up to 76.53mm) were favorable for conducting biological cycle of the bacterium. Observations on pods of cowpea emphasized sporadic appearance of disease symptoms in the form of circular spots that have acquired a brown with the edge reddish-brown. The pods attacked by *P.syringae* pv. vigne have formed smaller and shriveled grains, with brown spots on the skin. The degree of attack produced by this pathogen was 13.26 to 36.3% range, it is also correlated negatively with photosynthesis process (r = - 0.660 **). From late June - early July, cowpea plants were infected with *Uromyces appendiculatus* (Pers.) Link, which recorded a level of 15.1 to 30.23% range attack, being negatively correlated with the rate of photosynthesis. Attack symptoms were observed during phenophase flowering - formed pods on the underside of leaves, on stems and pods in the form of reddish-brown powdery pustules composed of teleutospores fungus. Later in August, instead of uredospore pustules, especially on the underside of leaves, small blisters have appeared brown-blackish dust contained teleutospores fungus.They were observed, reddish brown spots on the leaf and on the pods.

The climatic conditions registered during the study were favorable to plant cowpea aphids infestation (*Aphis fabae*), whose frequency of attack was between 9.97 to 52.2%, which is also negatively correlated with the plant photosynthesis rate at flowering (Figure 1). Analyzing the influence of fungicide treatment on the degree of attack produced by pathogens (Figure 2) revealed action differentiation of product applied, depending on the pathogen. Thus, the cowpea aphid borne virus infection was monitored at more than by systemic product Topsin 500SC, applied in a concentration of 0.07% in the two phases of growth of the plant, the degree of attack being reduced by 60.8% compared to untreated. The sunburn bacteria (*P. syringae pv. vignae*) and rust (*U.appendiculatus*) has recorded the lowest degree of attack in the variants treated with Shavit F72 WP 0.2%, a fungicide with systemic and contact action. Treatment with this fungicide has reduced with 38.4% of the attack by *U. appendiculatus* and 52.2%% of the attack by *P. syringae pv. Vignae*, compared with its non-treated with a fungicides.

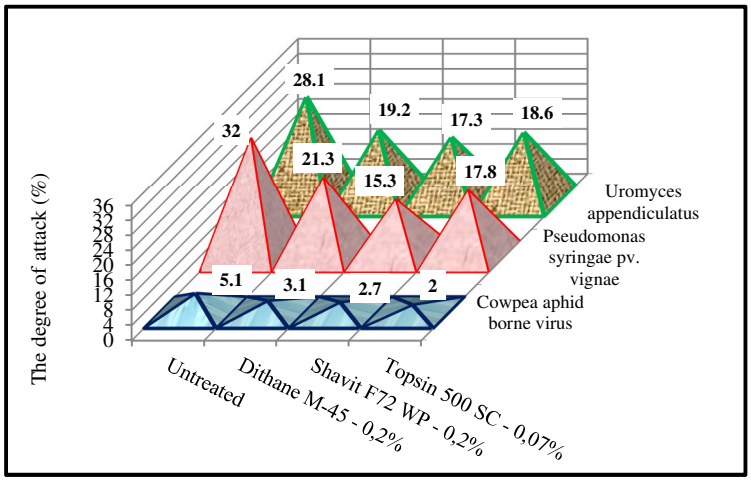

Figure 2. Evolution of the pathogens attack on the culture of cowpea, according to the phytosanitary treatment

The frequency of attacks, produced by *A. fabae* aphids and by *Acanthoscelides obtectus* ladybug, in cowpea crop was differentiated according to the treatment plant with insecticides (Figure 3).

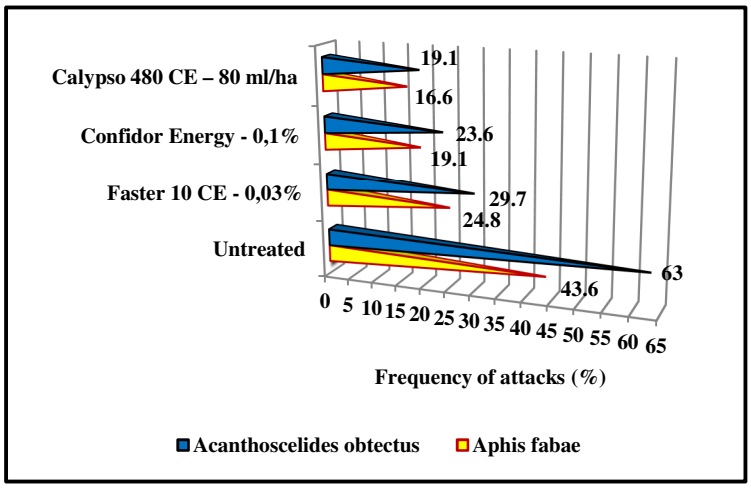

Figure 3. Evolution of the frequency of pest attack on the culture of cowpea, according to the treatment phytosanitary

Compared with untreated variant, where there was the maximum frequency (43.6% attack frequency produced by aphids and 63% attack frequency produced by ladybug), the most effective treatment was performed by applying a two insecticide treatment in vegetation plant with Calypso 480 EC, 80 ml/ha. In this experimental version, has been a reduction in the frequency by attack Aphis fabae to 61.9% and to 69.7% by *A. obtectus*, compared to untreated control with insecticides. The production results, show a significant and very significant difference by applying a mixture of fungicides and insecticides (Table 2).

Table 2. The influence of phytosanitary treatment on the grain yield obtained at cowpea

Variants		Grain yield		
Fungicides	**Insecticides**	**Kg/ha**	**The difference compared to the control**	**Significance**
Untreated	Untreated	1233.3	Control	Control
	Faster 10 CE	1353	119.7	-
	Confidor Energy	1384	150.7	-
	Calypso 480 CE	1445.7	212.4	-
Dithane M-45	Untreated	1476.3	Control	Control
	Faster 10 CE	1639.3	163	-
	Confidor Energy	1757.7	281,4	-
	Calypso 480 CE	1799.3	323	*
Shavit F72 WP	Untreated	1930.7	Control	Control
	Faster 10 CE	2313.7	383	*
	Confidor Energy	2508	577,3	***
	Calypso 480 CE	2521.7	591	***
Topsin 500 SC	Untreated	1974	Control	Control
	Faster 10 CE	2503.7	529.7	***
	Confidor Energy	2667.3	693.3	***
	Calypso 480 CE	2750.7	776.7	***

LSD 5% - 304 kg/ha; LSD 1% - 430 kg/ha; LSD 0.1% - 554 kg/ha

Compared with the untreated control, the best effect of insecticides on the grain yield obtained in cowpea, was recorded when they were applied in combination with systemic fungicides (Topsin 500SC) or systemic and contact (F72 Shavit WP). Of the three insecticides experienced the cowpea culture, the best effect on grain production have registered Calypso 480 EC and Confidor Energy products. The maximum of production (2750.5 kg/ha) was recorded in the variant treated with Topsin 500 SC + Calypso 480CE, 80ml/ha.

The degree of pest attack agents have negatively influenced the production of grain beans (Table 3). Thus it was established distinct significant negative correlations between the degree of attack of pathogens (Cowpea aphid borne virus, Pseudomonas syringae pv. Vignae Uromyces appendiculatus) and grain yield. Also, the frequency produced by *A. fabae* attack vas correlated significantly negatively with the results of production and the frequency produced by *A. obtectus* attack was negatively correlated, but not significantly, with production of cowpea grains.

Table 3. Correlations between grain yield obtained at the cowpea and the attack of pests and pathogens identified in culture

Correlations	The equations	Correlation coefficient (r)
Grain yield (kg/ha) x Cowpea aphid borne virus (Ga%)	Y = - 0.0035x + 10.054	r = - 0.735**
Grain yield (kg/ha) x *Pseudomonas syringae pv. Vignae* (Ga%)	Y = - 0.0119x + 44.801	r = - 0.885**

Grain yield (kg/ha) x *Uromyces appendiculatus* (Ga%)	Y = - 0.0119x + 44.801	r = - 0.804**
Grain yield (kg/ha) x *Aphis fabae* (F%)	Y = - 0.016x + 58.933	r = - 0.585*
Grain yield (kg/ha) x *Acanthoscelides obtectus* (F%)	Y = - 0.0139x + 61.004	r = - 0.405

CONCLUSIONS

The cowpea plant infection with cowpea aphid borne virus, was controlled best with systemic product Topsin 500SC applied at a concentration of 0.07%, which reduced the attack by 60.8% compared to untreated.

The phytosanitary treatment of cowpea crop with Shavit F72 WP 0.2% caused a reduction the degree of attack by Uromyces appendiculatus with 38.4% and by 52.2% of the attack by *Pseudomonas syringae pv. Vignae*, compared to the control untreated..

The phytosanitary treatment of cowpea crop with Calypso 480EC, 80 ml/ha led to a decrease attack frequency of 61.9%, at *Aphis fabae* and with 69.7% at *Acanthoscelides obtectus*, compared to untreated control with insecticides.

The maximum grain yield at cowpea (2750.5 kg/ha) was registered by applying two phytosanitary treatments with Topsin 500SC, 0.07% + Calypso 480CE, 80 ml/ha, in stages 3-4 leaves and flowering plants.

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