University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Romania
Faculty of Agriculture
Tel: 0264-596.384, Fax: 0264-593.792
www.usamvcluj.ro

Efficacy of conventional and unconventional treatments against common blight (*Xanthomonas canpestris* pv. *phaseoli*) within induced electromagnetic field

Claudia BALINT[1], Ioan OROIAN[1]*, Antonia ODAGIU[1], Vasile SURDUCAN[2], Daniela BORDEA[1]

[1]Faculty of Agriculture. University of Agricultural Science and Veterinary Medicine, Cluj – Napoca, Romania
[2]National Institute of Research and Development for Isotopic and Molecular Technologies, Cluj – Napoca, Romania
Corresponding author, e-mail: neluoroian@gmail.com

6th CASEE conference
"Latest Trends in Bioeconomy in Danube Region"

INTRODUCTION

The latest goal for agriculture is to use the physical factors in order to enhance vegetable production with environmentally friendly action and no negative effects upon plants.

Most perspective factors:
- ✓**ultrasound and ionizing radiation;**
- ✓ **magnetic field;**
- ✓**electromagnetic waves;**
- ✓ **optical emission, etc.**

Positive effects on:
- ✓**seeds germination;**
- ✓**root and stem growth;**
- ✓**leaves area and dry matter content;**
- ✓**plant yields, etc.**

Safe methods for a health crops production include the reasonable use of chemicals and substitution of some of them by appropriate physical treatment.

Is a scarcity in studies concerning the effect of electromagnetic field influence upon the plants resistance against different pathogens.

AIM

To emphasize the influence of an electromagnetic field upon *Phaseolus vulgaris* L. cv. Ardeleana resistance against common blight attack, in field conditions, when conventional and unconventional treatments were applied.

In Romania, the common bean consumption has an important tradition, being used in different food preparates and *Phaseolus vulgaris* L. cv Ardeleana, is the most cultivated variety.

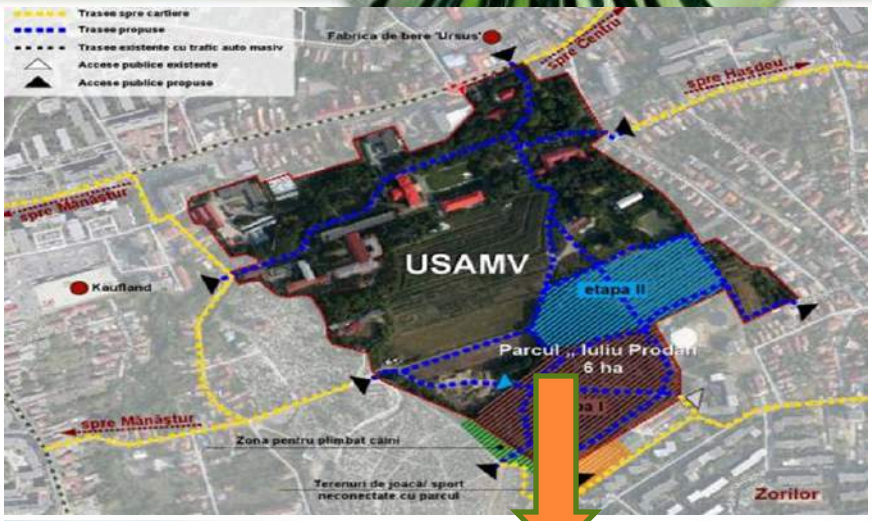
- ***Xanthomonas canpestris*** **pv. *Phaseoli* is the causal agents of common bacterial blight of bean.**

- **During the vegetation period, the disease affects all the overgrown plant organs.**

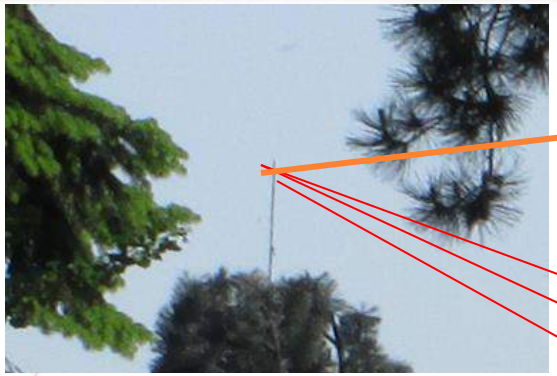
- **When the disease strongly attacks, the bacteria also affect the seeds.**

MATERIAL AND METHODS

- Our trial was developed on 56 m^2 experimental area, on 9 variants with 3 replications;
- The experimental period duration was May – September 2014.
- The biological material consists in common bean *Phaseolus vulgaris* L. cv. Ardeleana.



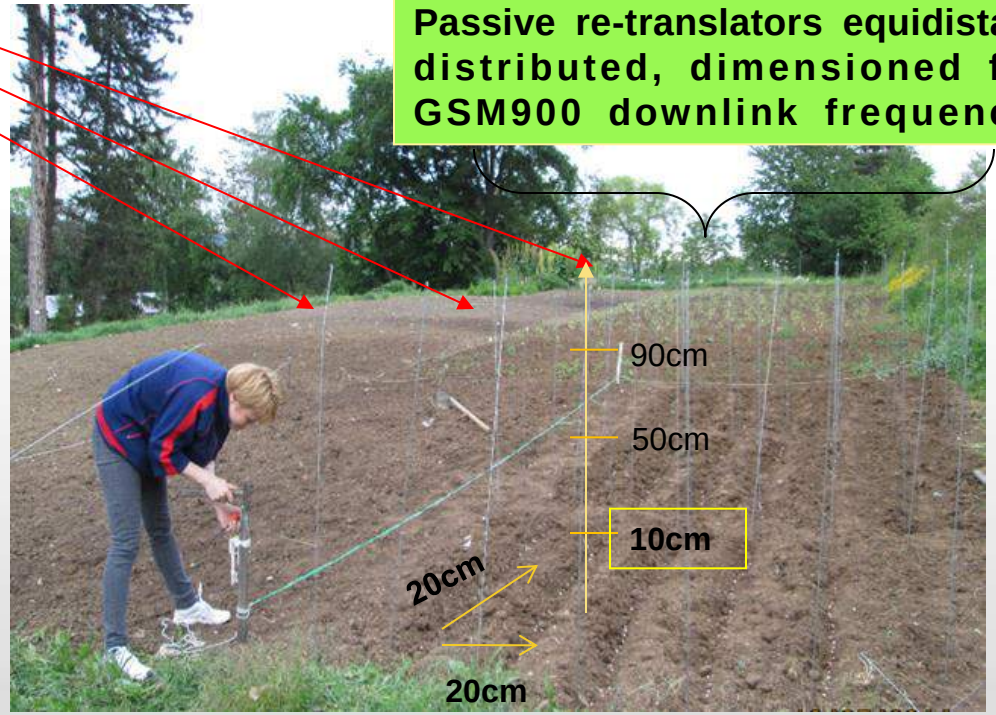
The installation for creating an electromagnetic field on the experimental area



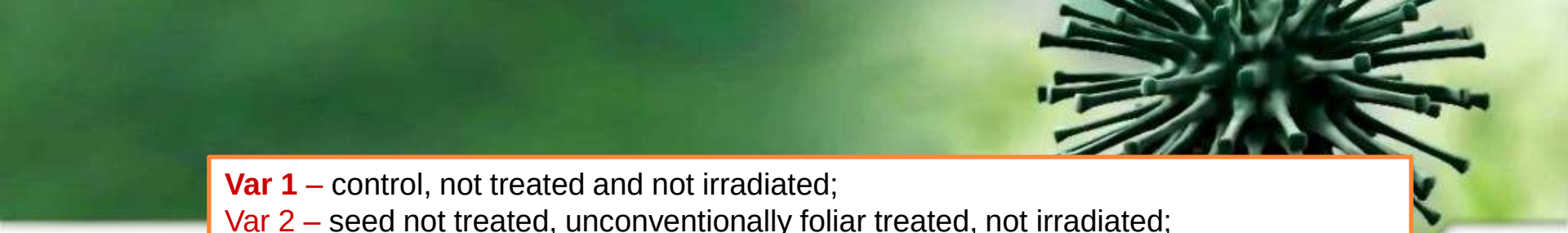
GSM antenna: 925 – 960 MHz frequency range.

Passive re-translators equidistant distributed, dimensioned for GSM900 downlink frequency.

Spectrum analyser Aaronia HS6060 type



EM conditions:
- average power density: 56.80 uW/m^2 - on exposure;
-average power density: 1.13 uW/m^2 - no exposure;



Var 1 – control, not treated and not irradiated;
Var 2 – seed not treated, unconventionally foliar treated, not irradiated;
Var 3 – seed not treated, conventionally foliar treated, not irradiated;
Var 4 – seed not treated, untreated foliar and placed in induced EM field ;
Var 5 – seed not treated, unconventionally foliar treated and placed in induced EM field;
Var 6 – seed not treated, conventionally foliar treated and placed in induced EM field ;
Var 7 – seed treated, not foliar treated and placed in induced EM field ;
Var 8 – seed treated, unconventionally foliar treated and placed in induced EM field;
Var 9 – seed treated, conventionally foliar treated and placed in induced EM field.

Observation in the field were performed from May up to September 2014

Seeds were treated using DIVIDEND M 030 FS (Syngenta).
Foliar application treatments :
• FLAMA (Holland Farming)
- unconventional treatment;
• CAPTAN 80 WDG (Arysta LifeScience)
- conventional treatment;

The common blight contamination levels was observed visual, the recording the attack frequency (%) and attack intensity (%).

STATISTICA v 7.0 Office programme was used for statistical data processing

RESULTS AND DISCUSSIONS

The results of our experiment emphasize that both irradiation and treatment conditions influence at very important extent the common bean resistance against *Xanthomonas canpestris* pv. *phaseoli* attack.

Table 1: Basic statistics and ANOVA test of common blight attack degrees of irradiated and non-irradiated conditions function of treatments

The biggest common blight average attack degree **(AD, %): V4**.

The lowest common blight average attack degree **(AD, %): V8.**

Significant differences of common blight attack degree **(AD, %)** are reported between variants **V4 and V1** (control), between **V3 and V6**, **V7 and V8**.

No significant differences of common blight attack degree **(AD, %)** was reported between **variants 1, control, V6, and V9**.

Issue	n	X_{AD}	s_X	s	CV%
Var1	10	$35.42^{a, c, d}$	1.03	3.28	9.26
Var2	10	$26.13^{a, b, c}$	1.47	4.67	17.86
Var3	10	$20.32^{a, b. c, d}$	1.60	5.08	24.97
Var4	10	$50.87^{a, b, c}$	5.55	17.55	34.51
Var5	10	$27.58^{a, b}$	1.84	5.83	21.15
Var6	10	$34.05^{a, b, c, d}$	1.17	3.71	10.89
Var7	10	$32.68^{a, b}$	2.74	8.67	26.52
Var8	10	$19.67^{a, b, c, d}$	1.41	4.48	22.77
Var9	10	$35.28^{a, b, d}$	1.32	4.19	11.88

XAD – common blight attack degree average by experimental period.
a – $p > 0.05$, b – $p < 0.05$; c – $p < 0.01$; d – $p < 0.001$

Correlated variables	Var2	Var3	Var4	Var5	Var6	Var7	Var8	Var9
Var1	+0.626	-0.571	-0.430	+0.425	-0.271	+0.492	-0.895	-0.635
Var2		-0.448	-0.637	-0.614	-0.066	+0.224	-0.027	+0.486
Var3			+0.937	-0.333	-0.464	-0.352	+0.899	-0.075
Var4				+0.537	+0.548	-0.448	-0.988	-0.621
Var5					+0.465	-0.130	+0.554	-0.678
Var6						+0.297	+0.422	-0.498
Var7							-0.686	+0.047
Var8								-0.226

Fig. 1. The matrix correlation of common blight average attack degree in common bean, function of treatment and electromagnetic field exposure, during experimental period**.**

No.crt.	Eigenvalue	% Total - variance	Cumulative - Eigenvalue	Cumulative - %
1	4.897953	54.42170	4.897953	54.4217
2	2.105158	23.39064	7.003111	77.8123
3	1.598493	17.76103	8.601603	95.5734
4	0.398397	4.42663	9.000000	100.0000

Factor Loadings (Extraction: Principal components		
Issue	Factor - 1	Factor - 2
Var1	0.933098	-0.332216
Var2	0.716570	-0.401754
Var3	0.015188	0.882158
Var4	0.991912	-0.074563
Var5	-0.522423	-0.331496
Var6	-0.526625	-0.726782
Var7	0.440007	-0.632332
Var8	-0.674614	-0.101750
Var9	0.867630	0.036404
Explained Variance	4.897953	2.105158

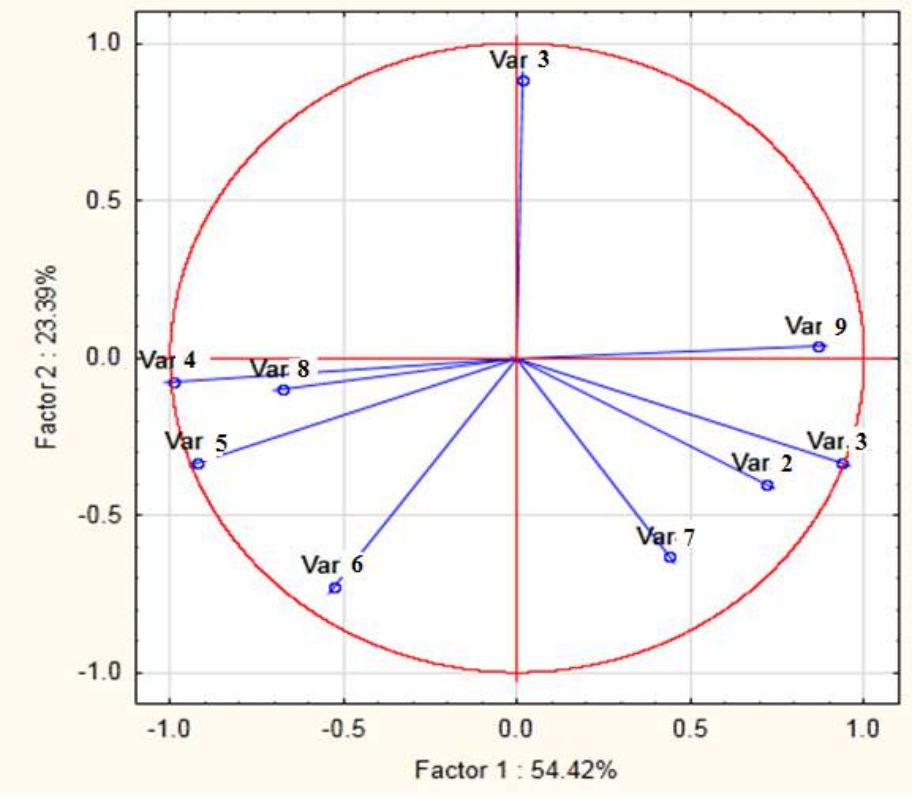


Fig. 2. The PCA conducted in different conditions supplied within experimental field of common blight attack on *Phaseolus vulgaris* L. cv. Ardeleana.

Conclusions

The use of induced electromagnetic field in fighting against common blight (*Xanthomonas canpestris* pv. *phaseoli*) attack on the most spread Romanian common bean variety may be taken into consideration if appropriate phytosanitary treatments are applied.

Our study demonstrates that, using untreated bean seeds, plants with no foliar treatments and placed on induced electromagntic field (Var. 4), same, seeds untreated, with no foliar treatments and no electromagnetic field (Var. 1), must be avoided.

Further research is needed in order to establish if experimental conditions consisting in seeds treated with DIVIDEND, plants unconventionally foliar treated with FLAMA and placed in induced electromagnetic field (Var. 8), represent the best solution against common blight attack.

Acknowledgements. This paper was published under the frame of European Social Fund, Human Resources Development Operational Programme 2007-2013, project no. POSDRU/159/1.5/S/132765.

Thank you for your attention!!!