ABSTRACT OF PhD THESIS
RESEARCH REGARDING THE PHYTOSANITARY PROTECTION OF WHEAT CROP IN DIFFERENT ENVIRONMENTAL CONDITIONS

Considering the ONU perspectives regarding agriculture and food (FAO) the necessary of wheat must increase up to 1000 mil. tones until 2020. For realize this goal the wheat productivity must increase in a fast rhythm up to 2%. Wheat is a basic cereal for human being food. The global wheat production increased rapidly in the last part of twenty century due to the technological progress (machinery, fertilizing, etc.). To realize a high yield level the researchers must find new solutions to manage weeds, pests and diseases, starting with their monitoring and continue with specific strategies for each area conditions. Among Diseases, pests and weeds, the last ones determine the highest losses. All over the time weeds were defined in different ways by researchers and farmers. The Romanian Encyclopedic Dictionary (1962) weeds are defined as:,, foreign plants in a crop, which produce high losses, using the water and nutrients from the soil and finally determine yield decreases ,,The seed mast be protected against soil-borne diseases and pests, as well as against foliar diseases and pests. The minimal protection has as goal to cover the main risks: Fusarium Head Blight, Spot Blotch and Dwarf and Common Bunt.

The main objectives were:

1- The monitoring of main diseases, pests and weeds in different environmental conditions;
2- To establish the most efficient management technology against diseases, pests and weeds depending on the environmental conditions using gross product index;
3- The seed treatment influence and that applied in different stages to wheat morphological traits and yield level in different environmental conditions.

1. THE MONITORING OF MAIN DISEASES, PESTS AND WEEDS IN DIFFERENT ENVIRONMENTAL CONDITIONS

a. During three years (2005, 2006 and 2008) in four different places: Iazu, Caracal, Roznov and Mihai Valley in wheat plots using four technological conditions were evaluated the main biotic constrainers (diseases, pests and weeds), as follows:
   1. Control technology
   2. Standard technology
   3. Improved technology
   4. Advanced technology

   It was noticed the attack degree for pathogens and pests and weeds number/m^2. The results were evaluated comparing the applied technologies using as check the control technology.

b. During four years in ARDS Simnic area were evaluated the specific wheat pests and were established the control strategies.

2. THE ESTABLISHMENT OF THE MOST EFFIECIENT TECHNOLOGY TO CONTROL DISEASES, PESTS AND WEEDS DEPENDING ON DIFFERENT ENVIRONMENTAL CONDITIONS USING GROSS PRODUCT INDEX

During three years (2005, 2006 and 2008) in four places: Iazu, Caracal, Roznov and Mihai Valley using the results of the applied cropping technology (control, standard, improved and advanced) were determined the yield and gross product index. The wheat cropping technologies are presented in tables 1 to 4.The control technology use treated seed and split fertilizing system, while the standard technology recommends to use herbicides, fungicides to control foliar pathogens and insecticides to control pests using common products. The improved technology used Syngenta Company products, while the advanced technology used the most performing products from Syngenta Company, applying also the second treatment in vegetation.

The gross product index represents an important indicator for farming activity. To calculate the gross product index is necessary to know the costs, such as: fertilizers, seeds (including seed treatment cost), fungicides, herbicides, insecticides, assurance, irrigation and other costs.

Table 1

The different wheat cropping systems applied to Iazu place

Traits	**Control tehnology**	**Standard tehnology**	**Improved tehnology**	**Advanced tehnology**
Variety	Dropia	Dropia	Dropia	Dropia
Seed treatment	Divident 1l/t	Sumi 8 2 FL 1,5 l/t	Divident 0,30 FS 1l/t	Celest Star 1l/t
Fertilized	18-46-0 200 kg/ha (october) nitrogen 100 kg/ha (march)	18-46-0 200 kg/ha (october) nitrogen 100 kg/ha (march)	18-46-0 200 kg/ha (october) nitrogen 100 kg/ha (march)	18-46-0 200 kg/ha (october) nitrogen 100 kg/ha (march)
Weeds control	-	2,4 D 1l/ha	Peak 75 WG 20 g/ha	Lintur 0,15 kg/ha
Diseases control	-	Carbendazim 0,60 l/ha	Artea 330 EC 0,40 l/ha	Artea 330 EC 0,40 l/ha AmistarXstra 0,50 l/ha
Pests control	-	Cipertrin 0,20 l/ha	Karate 2,5 CS 0,15 l/ha	Actara 80g/ha

Table 2

The different wheat cropping systems applied to Caracal place

Traits	**Control tehnology**	**Standard tehnology**	**Improved tehnology**	**Advanced tehnology**
Variety	Dropia	Dropia	Dropia	Dropia
Seed treatment	Divident 1l/t	Divident 1l/t	Divident 1l/t	Divident 1l/t
Fertilized	nitrogen 150 kg/ha (march)	nitrogen 150 kg/ha (march)	nitrogen 150 kg/ha (march) nitrogen 60 kg/ha (may)	nitrogen 150 kg/ha (march) nitrogen 90 kg/ha (may)
Weeds control	-	2,4 D 1l/ha	Peak 75 WG 20 g/ha	Lintur 0,15 kg/ha
Diseases control	-	Carbendazim 0,60 l/ha	Artea 330 EC 0,40 l/ha	Artea 330 EC 0,40 l/ha AmistarXstra 0,50 l/ha
Pests control	-	Cipertrin 0,20 l/ha	Karate 2,5 CS 0,15 l/ha	Actara 80g/ha

Table3

The different wheat cropping systems applied to Roznov place

Traits	**Control tehnology**	**Standard tehnology**	**Improved tehnology**	**Advanced tehnology**
Variety	Dropia	Dropia	Dropia	Dropia
Seed treatment	Divident 1l/t	Sumi 8 2 FL 1,5 l/t	Divident 0,30 FS 1l/t	Celest Star 1l/t
Fertilized	18-46-0 200 kg/ha (oct) nitrogen 100 kg/ha (march)	18-46-0 200 kg/ha (oct) nitrogen 100 kg/ha (march)	18-46-0 200 kg/ha (oct) nitrogen 100 kg/ha (march)	18-46-0 200 kg/ha (oct) nitrogen 100 kg/ha (march)
Weeds control	-	2,4 D 1l/ha	Peak 75 WG 20 g/ha	Lintur 0,15 kg/ha
Diseases control	-	Carbendazim 0,60 l/ha	Artea 330 EC 0,40 l/ha	Artea 330 EC 0,40 l/ha AmistarXstra 0,50 l/ha
Pests control	-	Cipertrin 0,20 l/ha	Karate 2,5 CS 0,15 l/ha	Actara 80g/ha

Table 4

The different wheat cropping systems applied to Valea lui Mihai place

Traits	**Control tehnology**	**Standard tehnology**	**Improved tehnology**	**Advanced tehnology**
Variety	Dropia	Dropia	Dropia	Dropia
Seed treatment	Divident 1l/t	Sumi 8 2 FL 1,5 l/t	Divident 0,30 FS 1l/t	Celest Star 1l/t
Fertilized	20-20-0 300 kg/ha (oct)	20-20-0 300 kg/ha (oct)	20-20-0 300 kg/ha (oct)	20-20-0 300 kg/ha (oct)
Weeds control	-	Peak 75 WG 20 g/ha	Peak 75 WG 20 g/ha	Peak 75 WG 20 g/ha
Diseases control	-	Carbendazim 0,60 l/ha	Artea 330 EC 0,40 l/ha	Artea 330 EC 0,40 l/ha AmistarXstra 0,50 l/ha
Pests control	-	Supersect 0,20 l/ha	Karate 2,5 CS 0,15 l/ha	Actara 80g/ha

The gross product index doesn`t involves direct inputs or structure costs, which represent: fuel costs, machinery repair costs, land design costs, social costs, professional costs, rent costs, credit costs, salary costs, cereals transport costs, etc.

The formula for net product index is: Net Product=Gross Product – structure costs

The variety used in the experience was Dropia.

3. THE INFLUENCE OF SEED TREATMENT AND THAT APPLIED IN DIFFERENT STAGES IN VEGETATION TO WHEAT MORFOLOGYCAL TRAITS AND YIELD LEVEL IN DIFFERENT ENVIRONMENTAL CONDITIONS

a. For this experiment were used data from two experimental platforms: Ţăndărei and Berești. During three years (2005, 2006 and 2008) have been tested four seed treatment variants and four treatment variant in vegetation having 225 m^2 each.

The experience was designed as follows:

- For seed treatment variants was used Syngenta technology with only one fungicide: Peak (herbicide) + Menara (fungicide) + Actara (insecticide).
- In other variants with treatment in vegetation it was used Celest Star for seed treatment and different formula in vegetation (v_1- Competitie, v_2- Menara, v_3- two treatments with Menara, v_4- Amistar).

The wheat variety was Kristina and sowing deep was 4 cm.

b. During three years (2005-2007) on the platform from Caracal have been studied seven treatment variants in three replications, as follows:

V1. Divident (control);

V2. Yunta;

V3. Tonic Pack;

V4. Cruiser + Celest star (seed treatment) + Menara early applied (treatment in vegetation);
V5. Cruiser + Celest star (seed treatment) + Menara delayed applied (treatment in vegetation);
V6. Cruiser + Celest star (seed treatment) + two treatments with Menara (treatment in vegetation);
V7. Cruiser + Celest star (seed treatment) + Tango (treatment in vegetation).

Using the results was studies the influence of these treatments to the following traits: total plants number/m^2, heads number/ m^2, seeds number/head, head length, yield, 1000 kernels weight and test weight. The wheat variety was Kristina.

c. During three years (2006-2008) on the platform from Șimnic was studied the effect of herbicides, fungicides and insecticides application to yield level and its main components, using different variants, as follows:

Table 5

The technological variants tested to wheat crop on the brown reddish soil from ARDS Simnic

V1 **Axial one 1,3 l/ha** **Menara 0,4 l/ha** **Karate Zeon 0,15 l/ha** **Actara 0,07kg/ha**		**V1** **Lintur 0,15 kg/ha** **Artea 0,4 l/ha** **Menara 0,4 l/ha** **Karate Zeon 0,15 l/ha** **Actara 0,07kg/ha**		**V1** **Lintur 0,15 kg/ha** **Karate Zeon 0,15 l/ha** **Actara 0,07kg/ha** **Menara 0,4 /ha** **Amistar 0,5 l/ha**
V2 **Lintur 0,15 kg/ha** **Traxos 1,3 l/ha** **Menara 0,4 l/ha** **Karate Zeon 0,15 l/ha** **Actara 0,07 kg/ha**		**V2** **Lintur 0,15 kg/ha** **Artea 0,4 l/ha** **Prosaro 0,9 l/ha** **Karate Zeon 0,15 l/ha** **Actara 0,07kg/ha**		**V2** **Lintur 0,15 kg/ha** **Decis 0,8 l/ha** **Calipso 0,25 l/ha** **Menara 0,4 /ha** **Amistar 0,5 l/ha**
V3 **Sekator 1 l/ha** **Menara 0,4 l/ha** **Karate Zeon 0,15 l/ha** **Actara 0,07kg/ha**		**V3** **Lintur 0,15 kg/ha** **Menara 0,4 l/ha** **Amistar 0,5 l/ha** **Karate Zeon 0,15 l/ha** **Actara 0,07kg/ha**		**V3** **Lintur 0,15 kg/ha** **Proteus 0,75 l/ha** **Menara 0,4 /ha** **Amistar 0,5 l/ha**
V4 **Axial 0,9 l/ha** **Granstar 15 g/ha** **Menara 0,4 l/ha** **Karate Zeon 0,15 l/ha** **Actara 0,07kg/ha**		**V4** **Lintur 0,15 kg/ha** **Falcon 0,7 l/ha** **Nativo 1 l/ha** **Prosaro 0,9 l/ha** **Karate Zeon 0,15 l/ha** **Actara 0,07kg/ha**		**V4** **Lintur 0,15 kg/ha** **Actara 0,07kg/ha** **Menara 0,4 /ha** **Amistar 0,5 l/ha**
V5 **Axial 0,9 l/ha** **Logran 37,5 g/ha** **Menara 0,4 l/ha** **Karate Zeon 0,15 l/ha** **Actara 0,07kg/ha**		**V5** **Lintur 0,15 kg/ha** **Artea 0,4 l/ha** **Menara 0,4 l/ha** **Amistar 0,5 l/ha** **Karate Zeon 0,15 l/ha** **Actara 0,07kg/ha**		
HERBICIDE BLOCK		**FUNGICIDE BLOCK**		**INSECTICIDE BLOCK**

It was determined: yield, seeds number/head, seeds weight/head, 1000 kernels weight and test weight.

d. On the platforms Vinţu de Jos and Sântălău were realized six variants, as follows:

V1. Cruiser + Divident + Karate Zeon + untreated with fungicides;
V2. Cruiser + Divident + Menara + Actara;
V3. Cruiser + Divident + Menara (80% flowering) + Actara;
V4. Cruiser + Divident + Artea –T1 + Amistar – T2;
V5. Tonic Plus + Actara + Artea + Amistar;
V6. Lindan + Actara + Artea + Amistar.

The pests were evaluated using attack degree and was studied the influence of these treatments to pests.

THE OBTAINED RESULTS

On Iazu platform the main pathogens were *Septoria tritici, Erysiphe graminis, Puccinia* sp., and *Cladosporium.* The attack frequency ranged between 10% and 85% to *Septoria tritici* (the advanced technology comparatively with the standard one), between 10% and 80% to *Erysiphe graminis* (the advanced technology comparatively with the standard one), between 1% and 20% to *Puccinia graminis* (the advanced technology comparatively with the standard one) and between 4% and 18% to *Cladosporium* (the advanced technology comparatively with the standard one).

The weeds presented to Iazu were: *Anthemis arvensis* (ANTAR), *Veronica hederifolia.* (VERHE), *Capsella bursa pastoris* (CAPBP), *Sinapis arvensis* (SINAP), Daucus *carota var. spontanea* (DAUCA) and *Convolvulus arvensis* (CONAR).

The diseases presented to Caracal were *Septoria tritici* between 10% and 96% (the advanced technology comparatively with the control one), *Erysiphe graminis* between 3% and 42% (the advanced technology comparatively with the control one) and *Fusarium graminearum* between 7% and 10% (the advanced technology comparatively with the control one).

The most widely spread weed from Caracal was Cirsium arvense with 6 plants/m^2.

To Roznov were presented only the pathogens *Erysiphe graminis* and *Cladosporium.* The treatment reduced the attack degree to 20% for *Erysiphe graminis* even for standard variant, but had no effect to *Cladosporium.*

To Mihai Valley the pathogens presented were *Erysiphe graminis*, *Septoria tritici* and the pethogens complex responsible for Black Point symptom + Fusarium.

There was observed also the pests and the most important was *Lema melanopa.*

To ARDS Simnic the pests evaluated during the period 2004-2008 belong to seven different orders: *Thysanoptera* (6,4-71%), *Homoptera* (3,2-39,8%), *Heteroptera* (0,5-2,7%), *Hymenoptera* (0,6-1,7%), *Coleoptera* (11,4-83,7%), *Lepidoptera* (0,3-1%) and *Diptera* (3,5-12,8%).

To Iazu experiment only the improved and advanced technologies are economically efficient, the increases from 61,17 euro/ha to 165,81 euro/ha were significant and very significant superior to control technology.

All variants are economically efficient using gross product index comparatively with control variant, the increases were very significant, as follows: 155,48 euro/ha

(standard technology), 217,44 euro/ha (improved technology) and 280,58 euro/ha (advanced technology).

In the ecological conditions from Roznov all variants recorded increases of gross product index, but these values are lower comparatively with the control variant. The advanced technology is not economically efficient comparatively with the improved technology. The difference between the control variant and standard technology was 102,2 euro/ha, while the difference between improved variant and advanced one was 2,35 euro/ha.

The lowest gross product index was recorded to Mihai Valley for control variant (416,6 euro/ha). The gross product index values for other variants were higher and ranged between 700 and 768,05 euro/ha.

Tonic product had a negative influence to yield components, which need future investigations.

In the experimental conditions from ARDS Caracal very significant yield increases which ranged between 414 and 733 kg/ha were recorded by variants (in growing order): Cruiser + Celest star + Tango, Cruiser + Celest star + Menara (delayed applied), Cruiser + two treatments with Menara and Yunta. The variant treated with Tonic Pack recorded a distinct significant increase (280 kg/ha) and the variant Cruiser + Celest star + Menara early applied was to the control level.

The researches realized during three years with herbicides on the browh reddish soil to ARDS Simnic showed the favorable effect of Sekator herbicide, variant which recorded a very significant yield increase of 2104 kg/ha comparatively with the variant treated with Axial one herbicide.

The small effect of Axial one herbicide to weeds control is due to its selectivity for monocotyledons.

The variant Axial + Logran realized a good cultural hygiene and also a very signifaicant yield increase of 2076 kg/ha.

On the experimental platform from ARDS Simnic the herbicide Menara applied by itself or in combination with fungicid Amistar realized a good plants protection and also very significant yield increases

The application of Actara insecticide by itself or in combination with Karate Zeon realized very significant yield increases which ranged between 1050 and 1101 kg/ha comparatively with the variant treated with Decis + Calipso. O good protection against pests realized also the insecticide Proteus and the yield increase was 764 kg/ha (statistically assured as distinct significant).

RECOMMANDATIONS

The improved and advanced technology recorded the best economically results for all experimental areas.

The improved technology applied to Iazu involved the following traits: seed treatment with Divident 0,30 FS 1l/t, fertilizing with 200 kg/ha complex fertilizer 18:46:0 basal applied in autumn and 100 kg/ha nitrogen top-dress applied in early spring, Peak 75 WG 20 g/ha used for weeds control, treatments in vegetation for foliar diseases control using Artea 330 EC 0,4 l/ha and the insecticide Karate 2,5 CS 0,15 l/ha for pests control.

The advanced technology applied to Iazu involved the following traits: seed treatment with Celest Star 1l/t, fertilizing with 200 kg/ha complex fertilizer 18:46:0 basal applied in autumn and 100 kg/ha nitrogen top-dress applied in early spring, Lintur 0,15 kg/ha used for weeds control, treatments in vegetation for foliar diseases

control using Artea 330 EC 0,4 l/ha and AmistarXstra 0,5 l/ha and the insecticide Actara 80 g/ha for pests control.

The improved technology applied to Caracal involved the following traits: seed treatment with Divident 0,30 FS 1l/t, fertilizing with 150 kg/ha nitrogen applied in March and 60 kg/ha nitrogen applied in May, Peak 75 WG 20 g/ha used for weeds control, treatments in vegetation for foliar diseases control using Artea 330 EC 0,4 l/ha and the insecticide Karate 2,5 CS 0,15 l/ha to pests control.

The advanced technology applied to Caracal involved the following traits: seed treatment with Celest Star 1l/t, fertilizing with 150 kg/ha nitrogen applied in March and 90 kg/ha nitrogen applied in May, Lintur 0,15 kg/ha used for weeds control, treatments in vegetation for foliar diseases control using Artea 330 EC 0,4 l/ha and AmistarXstra 0,5 l/ha and the insecticide Actara 80 g/ha for pests control.

The improved and advanced technologies applied to Roznov were the same with those applied to Iazu.

The improved technology applied to Mihai Valley involved the following traits: seed treatment with Divident 0,30 FS 1l/t, fertilizing with 300 kg/ha complex fertilizer 20:20:0 basal applied in autumn, Peak 75 WG 20 g/ha used for weeds control, treatments in vegetation for foliar diseases control using Artea 330 EC 0,4 l/ha and the insecticide Karate 2,5 CS 0,15 l/ha to pests control.

The advanced technology applied to Mihai Valley involved the following traits: seed treatment with Celest Star 1l/t, fertilizing with 300 kg/ha complex fertilizer 20:20:0 basal applied in autumn, Lintur 0,15 kg/ha used for weeds control, treatments in vegetation for foliar diseases control using Artea 330 EC 0,4 l/ha and AmistarXstra 0,5 l/ha and the insecticide Actara 80 g/ha for pests control.

It is recommended the gross product index as an economic indicator for managing farming costs.

The monitoring of diseases, pests and weeds in different environmental conditions showed that cropping technologies must be established according on environmental factors.

Menara product had the best control to foliar diseases.

Among tested insecticides Actara showed the best efficacy to control wheat specific pests.

In the experiment realized to Caracal the technology that involved treatments with Cruiser + Celest star + Tango, Cruiser + Celest star + Menara delayed applied, Cruiser + two treatments with Menara and Yunta recorded very significant yield increases.

In the experiment realized to Simnic the best technologies were:

- Sekator for weeds control, Menara for foliar diseases, Karate Zeon and Actara for pests control;
- Lintur for weeds control, Menara + Amistar for foliar diseases control, Karate Zeon and Actara for pests control;