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Innovation technologies for defining developing periods of Eurygaster integriceps Puton in corn plants

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Abstract:

Quantitative and qualitative crop growing through monitoring and complex plant protection methods application of developing processes of the main corn plants pest, Eurygaster integriceps Puton, is one of the important tasks of agriculture. The fitomonitoring method allows us to make corrections to corn producing technologies, to define any factors negative affect and to create optimal conditions for cultures development. In the present paper the investigations results carried out on realization these tasks based on innovation automated computer systems have been presented.

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I. INTRODUCTION

The wheat is the important corn and feed culture and per year it on fields with area about 230 million hectares in world is growing. Their average crop equals 28-30 center/hectare and total crop is 600 million tons per year. On the FAO data in order to cover of the world population need with wheat and flour products growing up to 2-2.5 % for year is required. Therefore, protection of the producing wheat crop from pests and diseases and also application of modern information technologies are the one of actual problems.

Growing the volume of the produced wheat and flour products having high productivity, early ripening wheat sorts based on the modern agrarian technologies is an important task. Its solution requires using modern information technologies for protection of the wheat from pests and diseases, to predict application automated controlling system and also to introduce them to widely agriculture production.

The agriculture branch of the Uzbekistan the essential results in period of the independent years in task to assurance of population with grown in Uzbekistan grain and flour products had reached. For example, in the last years the average wheat productivity and total crop were 50-60 centner/hectare and 6-7 million ton, accordingly [6].

Using modern information technologies in agriculture, in particularly, in grain productivity is being requirement of modernity. At present in Uzbekistan the grain plant in fields with 1 million 303.9 hectares area is sewing and farmers the rich crop using modern intensive agrarian technologies are obtaining. This fact allowed them to decrease grain produce covering costs and to lead to the alternative degree of fertilizers norm and irrigation systems. Construction of a financial project of agriculture digitization branch in the framework of "Intelligent agriculture" conception is important task too [1].

The problems of protection of wheat from damage organisms by scientists of the leader countries as USA, Germany, France, Russia, China, India (J. Dinger, S. Hammad, L. Gavrilita, J. Klun, A. Spark, A. Burns, R. Mungomery, F. Paulian, A. Frolov, V. Voynyak, Ye. Xachaturova and at el) in the fields cultivated wheat and other grain products areas had been studied. It should be noted that this problem by scientists of Uzbekistan (N. Maxmudkho'jayev, M. Rashidov, B. Xasanov, A. Khamrayev, A. Sheraliyev and at el) was been investigated essentially too.

However, despite the fact that damage of grain cultures pests and diseases in Uzbekistan territories are being in high level the investigations on controlling methods using modern information technologies, predicting and producing mathematic models on the sufficiently level had not been carried out yet [11].

In particularly, damaging organisms which develop in irrigating grain plants fields in Uzbekistan climate conditions on the enough level did not been studied and effective fight methods against them systematically did not been developed. This situation had been created because of the last 20 years period in the irrigating areas a one type grain culture had been cultivated. As result in the grain plants agrarian biosenose the different damage organisms and useful entomophages fauna gradually had been constructed and this process is being continuing [8].

For example, at present to use the intensive resource conserving effective complex plant protection methods from damage organisms of grain plant in producing high and qualitative crop cultivating in the grain branch and also to introduce widely for producing them is important task [9].

One of the important tasks of phytomonitoring is to know and analyze the cultures state and to define the rejecting causes. Obtained earlier such information allows us to introduce an accuracy and corrections to the grain producing technology, to define the negative effects of the definite factors and to create the optimal conditions to the cultures development. It is impossible to realize these events without automated computer systems [11].

The Scientifically based complex fight system of plants protection from damage organisms is a sum of agrarian technical, biological, chemical and corresponding to

the modern requirements other methods which consists scientifically based crop rotation, controlling damage organisms, protecting natural enemies and nature pureness actions фтв фдкў allows us to grow qualitative crop [2].

II. MATERIALS AND METHODS

The investigations using common methods of plants protection have been carried out. In particularly, for construction of the phenological map V.V. Yaxontov and the several scientists, such as G.Ya. Bey-Biyenko, G.Ya. Bondarenko, N.V. Glushenko methodologies have been used. Revealing correctly on time pests of agricultural plants increases the efficiency of against them protection actions. Analysis obtained on the pest developing state in the culture sewed fields can define us the planned innovation (automated) producing methods.

The protection system from damage organisms of cultures is also a common technology of the grain productivity and it conserves a phytosanitary state of cultures.

In order to use plants protection methods on time and effectively the plans for the present and future long dated period will been constructed. These plans consist the agrarian technical, biological fight methods and organized-economical actions. The plans constructed for present and future long dated period take into account the changing prognosis of phytosanitary state of the concrete region.

Thus, construction and introduction the automated prognosis system of development and distribution of Eurygaster integriceps Puton in the grain plant increases for the several times the efficiency of the protection actions in the culture sewed areas. This procedure requires collecting the prognoses for long dated and short-dated periods of the pest appearance, development and distribution. In order to construct these prognoses, we need to define influencing to this process of factors, to study their composition and mechanisms. That is, we must to create the information basis.

Eurygaster integriceps Puton is the damage sucking insect of grain cultures distributed widely in the world which is seen often in the grain cultures areas. Its size 10-12 mm, gives one generation for season. One's adult under leaves on the ground between mountain rocks is wintered. In the second half of March it will fly into the grain plant fields. Later this insect begins to lay two lines on 8-10 lighting green, spherical shape eggs for each line. This process will last during 20-25 days. Female up to 180-300 lays eggs. After 7-10 days from eggs will appear young eurygaster integricepts. They feed juice of branches and leaves. In its developing period larvae transforms five stages and for the 30-40 days reaches to adult, in this state is wintered.

After reached to adult stage the insect damages sucking juice of ears of wheat. In result after damaged essentially the wheat ear dries out, stands white color and without grain that is being empty. Usually, after damaging the grain transforms to unmoved, holed state. The qualitative degrees (gluten, protein and at el) of the grain is decreased and the growth rate is decreased down to 50 %. Therefore, adults of 4-5 stages are dangerous essentially for crop. They can decrease the grains crop from 5-10 % down to 20-30 %.

III. RESULTS AND DISCUSSION

The program developed ourselves working in the Android type mobile phones carrying out cultures state phytomonitoring of developing, laying eggs, revealing the appearance time of larvae of Eurygaster integriceps Puton and for planning on time protection actions against ones is foreseen.

The novelty of carrying out investigations is that we apple the modern information technologies to reveal the monitoring system of development and distribution of Eurygaster integriceps Puton, to introduce accuracy its developing period and to construct the phenological map ones development. Besides, taking into account from climate conditions it allows us to check the pest developing, distributing and damaging periods.

It should be noted that the base of the automated prognosis system of

development of main pest of grain cultures and fight against ones periods is Android appendix too. Every day the climate information from hydro meteorological center directly to phone data base is introduced. Based on the climate degrees the appearance of this pest and its developing useful temperatures automatically are calculated. In result after revealing the concrete stage of the pest development to user the warning signal is transmitted. Using this information, the fight time is defined and protecting actions is carrying out. Know in advance appearing and damaging times of the pest is important because of these periods consist the base of organizing the fight against ones and increasing efficiency of these actions.

Having such information user can check and plan the optimal times of developing Eurygaster integriceps Puton and fighting against ones in the grain cultivated areas where observation is carrying out.

Table 1.
Optimal periods of developing and fighting against Eurygaster integriceps Puton observations carried out in Andijan region of Uzbekistan (observations of 2017-2019)

Districts	Developing times (days, months)									
	Female larvae			Eggs laying, the first stage			The second stage			Adults
	2017	2018	2019	2017	2018	2019	2017	2018	2019	2017
Oltinko'l	20.03	17.03	18.03	10.04	09.04	07.04	25.04	24.04	22.04	15.05
Baliqchi	19.03	16.03	16.03	08.04	07.04	06.04	22.04	20.04	19.04	12.05
Qo'rg'ontepa	25.03	21.03	20.03	15.04	13.04	11.04	30.04	28.04	27.04	18.05
Marhamat	21.03	19.03	18.03	12.04	10.04	07.04	26.04	24.04	22.04	17.05
Paxtaobod	21.03	20.03	19.03	12.04	11.04	09.04	26.04	24.04	22.04	17.05
Ulug'nor	20.03	18.03	17.03	10.04	08.04	06.04	24.04	21.04	20.04	15.05

Table 2.

Phenology of developing grain and Eurygaster integriceps Puton in Andijan region (observations of 2017-2019)

Months, decades		March			April			May	
		I	II	III	I	II	III	I	II
Average air temperature									
Grain culture's state		seedling	seedling	seedling - vegetative	Vegetative	vegetative	Budding	flowering	Milk ripenir
		seedling	seedling	seedling - vegetative	Vegetative	vegetative	Budding	flowering	Milk ripenir
		seedling	seedling	seedling - vegetative	Vegetative	vegetative	Budding	flowering	Milk ripenir
Eury integriceps Puton's state				+	+,(x)	(x),-	-, =	=,+	+
				+	+,(x)	(x),-	-, =	=,+	+
				+	+,(x)	(x),-	-, =	=,+	+

Conventional signs: P_d is the grain ripening period; (x) is the eggs laying period; - is the first stage larvae, = is the second stage larvae; + is the adults

The experiences in Andijan district climate conditions are carried out. Results obtained from experiences and observations have been presented on Table 1. The arrangements on development of Eurygaster integriceps Puton and definition of optimal periods of against ones fights in the farming of several districts of Andijan region have been carried out. For example, the appearance of Eurygaster integriceps Puton in the fields in “Muqaddas zamin ko’rki” (Oltinko’l), “Shahlo” (Ulug’nor), “Porloq kelajak imkoni” (Qo’rg’ontepa) farming corresponds in 2017 to 19-25 March, in 2018 to 16-21 March and in 2019 16-20 March. This basically with the climate conditions is explained. In March month of 2017 the temperature was comparatively lower, that is 8.6-8.8 ^{0}C. This situation leaded to retarding of the developing process. And further years the temperature has been increased up to 3,6-7,6 ^{0}C and appearance of pest have been accelerated. In the beginning of 2018 the average air temperature was 12.2-16.1^{0}C and in 2019 □ 12.2-16.4 ^{0}C. 1-2-decades of March corresponded to the wheat seedling and third decade – seedling-vegetative phases.

As observations showed that the eggs laying periods of female adults correspond in 2017 to 8-10 April, in 2018 to 7-13 April and in 2019 to 6-11 April. In result the

first stage larvae earlier in comparison of 2017 corresponding to 6-17 April had been appeared.

In the different districts of Andijan region the second stage larvae appeared in 22-30 April of 2017, 20-28 April of 2018 and 19-27 April of 2019. As the adults they appeared by these years 12-18, 11-16 and 10-15 May, accordingly (see Table 1). In these periods the appearance of pest adults corresponds to the milk-glue ripening phases (see Table 2). This situation provides wintering process after totally feeding of Eurygaster integriceps Puton.

As was been remarked in literature [??] that in order to organize the biological fight against Eurygaster integriceps Puton we could use the Telenomus insect. However, because of to present days the generation technology of this entomophage did not been realized the possibility of using ones is absent yet. Therefore, for fighting against pests eggs to use lacewing entomophages is appropriately (see Table 1). Unlike from telenomus generation of this insect in laboratory conditions is possible and it in special purposes can be used.

In order to reveal feeding degree of lacewing useful insect with eggs and larvae of Eurygaster integriceps Puton we have carried out in period of 2015-2017 years the laboratory experiences too. As these experiences results showed that the lacewing larva feeds average up to 6 eggs and up to 8 larvae pest of per day. Thus,

the lacewing larvae are capable to eat all eggs or larvae of Eurygaster integriceps Puton in period of 5 days. As observations showed in control (that is when entomophage did not used) variants this pest negative effect to the external marks and crop degrees of the wheat culture leads to essential changes, namely the negative effect of Eurygaster integriceps Puton to the wheat plant will be sensitive even when 2 *pests*/m^2 are present.

Phytomonitoring the crop state carried out in the grain fields (in Oltinko'l district 11-12 April, in Qo'g'ontepa district 13-17 April, in Ulug'nor district 10-11 April) with the program working in Android type phones which defines developing, eggs laying, larvae hatching periods of Eurygaster integriceps Puton, planning on time protection methods allowed us to obtain additional crop in lacewing used variants to 7-10 centner/hectare more than in control one.

IV. CONCLUSIONS

1. Thus, in the present paper the inculcation need of an ecological monitoring system using modern information technologies and computer techniques of development and distribution of the grain damage organisms have been justified.

2. The characteristic features of the automated monitoring and prognosis system on development and distribution of Eurygaster integriceps Puton in the grain cultures have been defined.

3. Transition to the new innovation prognosis and warning methods in protection of grain culture from Eurygaster integriceps Puton has the several advantages and this procedure provides us to decrease the labor costs in collection of first information, to increase the prognosis correctness and warning accuracy.

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