UDC 632.51:528.921:004

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PHYTOSANITARY MONITORING OF SORGHUM HALEPENSE IN ODESA REGION

Here there are given results of phytosanitary monitoring of spread of pest quarantine weeds – Sorghum halepense in the area of Odessa region. An electronic vector map indicating foci and buffer zones of Sorghum halepense was created by means of GIS technology.

Key words: *phytosanitary monitoring, quarantine weeds, Johnson grass (Sorghum halepense)*

Introduction. Nowadays introduction of aggressive foreign sorts is considerable part of global nature changes. Alien sorts penetrate into new territories without its natural enemies: ticks, insects, phytohelminths, phytopathogens that check their populations in balanced state. As a result of loss of natural biological control these sorts often become harmful in the places they had settled [1]. Losses due to invasions of alien sorts of plants on a world scale amount to milliards of dollars annually. Invasions of quarantine weeds represent particular danger.

In the South of Odessa region the most harmful quarantine weed is *Sorghum halepense L.* (Pers.), which according to document in force «List of vermins, plant diseases and weeds that have quarantine importance» is put into List A-2 «Quarantine organisms locally spread in Ukraine». Owing to its great over ground mass, as well as to powerful rootage *Sorghum halepense* can extrude other weeds in field conditions, depress field crops and influence negatively on growth and development of perennial plants, that results in lowering of harvest quantity and quality. The *Sorghum halepense* high harmfulness is provided by its allelopathical properties. Extracts of the weed leaves and roots depress development and germination of some crops including soya, clover, vetch, barley, wheat [2]. In addition to its competitiveness *Sorghum halepense* is the major natural reserve of dwarf mosaic corn [3].

Precondition for the most effective control of *Sorghum halepense* is timely phytosanitary monitoring. New achievements in GIS technology can significantly raise reliability and accuracy of phytosanitary monitoring and prognosis, while creation of GIS-maps will allow observing dynamics of harmful objects development during long period of time as well as their extension on each specific field that is important for test measures planning [4, 5].

The aim of this work was phytosanitary monitoring of quarantine weed – *Sorghum halepense*, as well as creation of electronic vector maps indicating foci and buffer zones of the weed in Odessa region.

Material and Methods. Phytosanitary inspection of lands for detection of *Sorghum halepense* was made in May – July by route method, that is inspecting each plot by passing its two diagonals and along four sides. Especially attentively we examined the sides that border upon roads. In case of the quarantine weed detection the whole area was considered as infested no matter of the rate of infestation [6]. In different parts of the plots that had *Sorghum halepense* we put 10-20 frames (depending on the plot area) 0,25 m^2 of size (50×50 sm). The calculated number of plants multiplied by 4 was written down into register and then converted to «psc./m^2». Occurrence of *Sorghum halepense* was calculated in percentage from the amount of test plots where that sort was detected to total number of test plots, density – in psc./m^2 [7].

Geographical coordinates of the points where the weed was detected were calculated by means of portable navigation system Garmin GPS 60. Creation of electronic maps indicating foci and buffer zones of the weed was made using program MapInfo v.11,0 in the following order:

1. Registration of basic map into given coordinate system: *File* > *Open* > file type: *Raster Image* > choose map > *Register.* For the cartographic basis we took topographical map of Odessa

region which is included in «Topographical maps of Ukraine 1:200000» and is accessible on site «http://www.gps-info.com.ua/». Projection of output materials is in MapInfo: Gauss-Kruger Zone 7 (Pulkovo 1942).

2. Load data from GPS-navigator into program Map Source: *File > Open*, determine route points, save them in GPS eXchange format and go to menu *File > Save as*. Start program Global Mapper: *Open > File > Export Vector Data > Export MapInfo TAB/MAP > OK*. Route points exported into MapInfo convert in projection of Gauss-Kruger Zone 7 (Pulkovo 1942).

3. Formation of buffer zone. Activate layer of the object around which buffer zones should be created (*Query > Select*). Perform command *Objects > Buffer*. Dialogue appears *Buffer objects*. Choose necessary radius of buffer, number of segments and distance units.

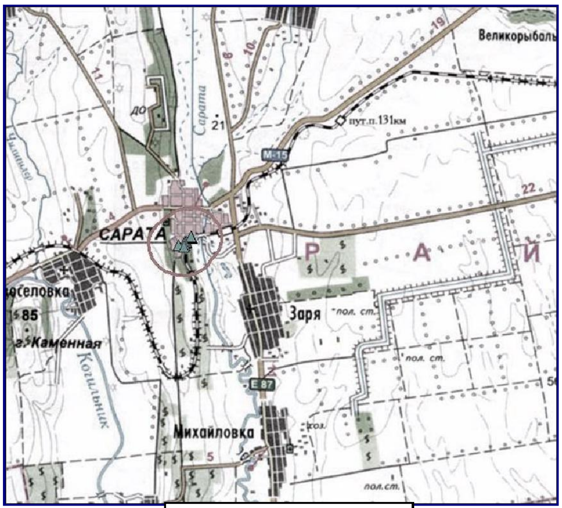
Results and discussion. During 2011-2013 years we carried out route inspections for detection pest quarantine weed (*Sorghum halepense*) foci in the territory of Odessa region. On the plots that were detected as having *Sorghum halepense* we estimated its development and spread.

The *Sorghum halepense* foci were detected in Bilgorod-Dnistrovskiy region v. Sadove PSP «Vinogradar» on area of 55 hectares; Ismail region v. Kamianka ASTV «Progres» on area of 20 hectares; Sarata region vct. Sarata DP «Santrade» elevator on area of 10 hectares; Tarutin region v. Berezino on area of 25 hectares; Artsiz region v. Deleni FG «Delenske» on area of 172 hectares, v. Novoivanivka on area of 508 hectares and in v. Novoholmske VAT «Aliagske HPP» on area of 13,4 hectares; Kilia region v. Mirne SVK «Druzhba» on area of 20 hectares, v. Trudove TOV «Pivdenne-1» on area of 38 hectares and FG «Kalashnikov» on area of 4 hectares.

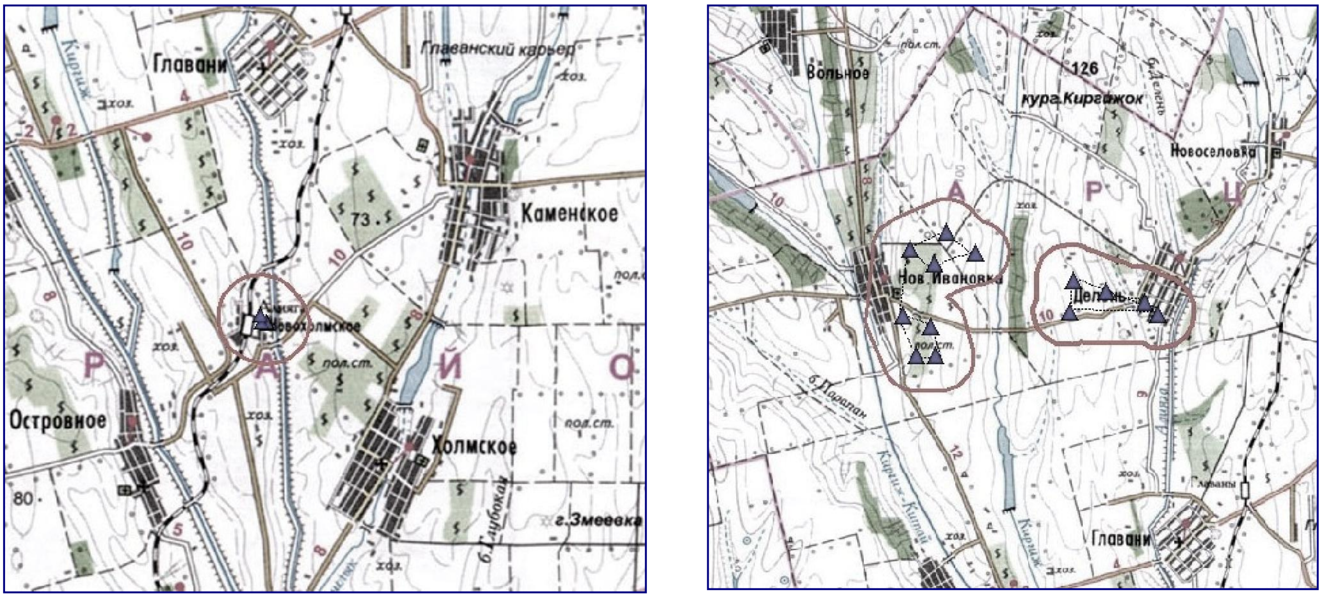
It was found according to route inspections that the greatest number and density of *Sorghum halepense* were detected in perennial plants. In peach garden of ASTV «Progres» v. Kamianka the weed number amounted 68 psc./m^2, occurrence – 70,0 %, in vineyard and peach garden of PSP «Vinogradar» in Bilgorod-Dnistrovskiy region – 62 psc./m^2 and 80,0 %, respectively. In v. Novoivanivka, Artsiz region in corn crops number of weed plants was upon the average 37 psc./m^2, occurrence – 30,0 %; in Tarutin region v. Berezino in corn crops – 23 psc./m^2 and 50,0 %. In agricultural lands of v. Mirne SVK «Druzhba» and farm «Pivdenne-1» v. Trudove of Kilia region number of weed plants varied from 29 to 41 psc./m^2, occurrence amounted – 50,0-60,0 %.

In no cultivated lands density and occurrence of weed plants were lower. Thus, in uprooted vineyards and roadsides of farm «Delenske» Artsiz region density of *Sorghum halepense* plants was 19 psc./m^2, occurrence amounted 40,0 %. The plant density in storage area of VAT «Aliagske HPP» Artsiz region was at 12 psc./m^2, occurrence amounted 40,0 %. In the territory of Sarata elevator number of *Sorghum halepense* plants was at 32 psc./m^2, occurrence amounted 20,0 %.

a - Bilgorod-Dnistrovskiy region

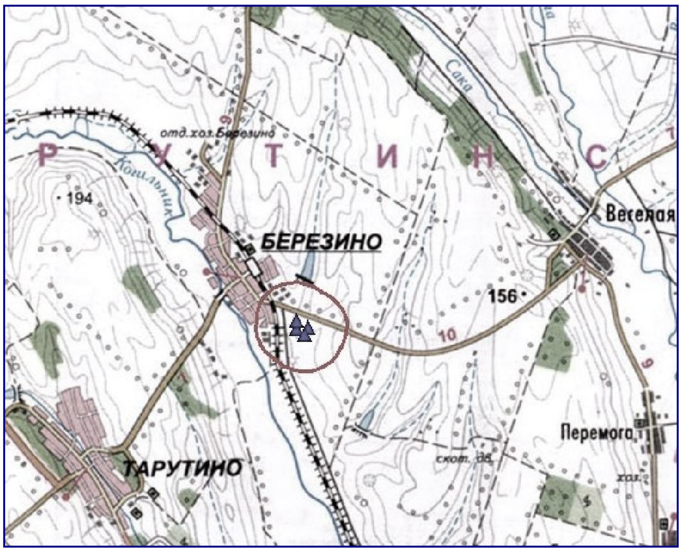


b– Sarata region

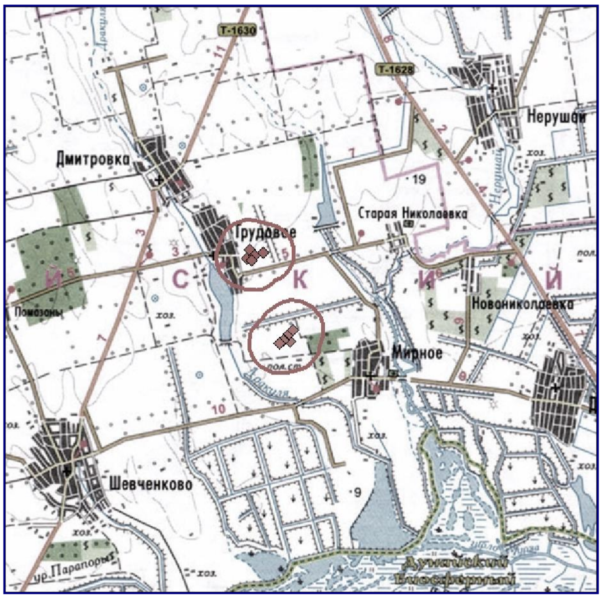


c – Artsiz region

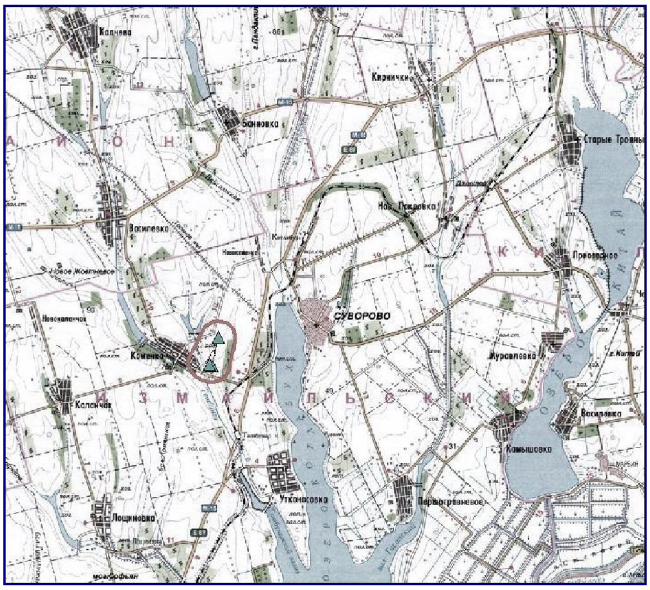
By means of GPS-navigator it was possible to determine foci of infection coordinates and create electronic vector maps of *Sorghum halepense* spread in borders of one farm and region (Fig. 1-a,b,c,d,e,f).



d– Tarutin region



e– Kilia region



f– Ismail region

Conclusion. Last years it has been seen accelerate spread of borders of pest quarantine weed – *Sorghum halepense*, that is provided not only by its biological peculiarities but significant lowering of farming culture as well.

Use of geographic information system (GIS) has great advantages in visualization of phytosanitary monitoring data with their further mapping, as well as in high accuracy of determination of areas settled by pest quarantine weed to provide on this basis highly effective measures of protection.

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Анотація

Могилюк Н.Т.

Фітосанитарний моніторинг сорго алепського в Одеській області

Наведено результати фітосанітарного моніторингу поширення карантинного бур'яну – сорго алепського на території Одеської області. За допомогою ГІС-технології була побудована електронна векторна карта з визначенням вогнищ і буферних зон сорго алепського.

Ключові слова: *фітосанітарний моніторинг, карантинні бур'яни, сорго алепське*

Аннотация

Могилюк Н.Т.

Фитосанитарный мониторинг сорго алепского в Одесской области

Приведены результаты фитосанитарного мониторинга распространения карантинного сорняка – сорго алепского на территории Одесской области. При помощи ГИС-технологий была построена электронная векторная карта с выделением очагов и буферных зон сорго алепского.

Ключевые слова: *фитосанитарный мониторинг, карантинные сорняки, сорго алепское*