Farmers Awareness on the Judicious Use of Pesticides as a First Step in the Prevention of Water Pollution in the Black Sea Basin *(Liliana Panaitescu, Simona-Mariana Pricop, Irina Moise, Daniela Jitariu)*	**"Cercetări Marine" Issue no. 46** **Pages 167-175**	**2016**

FARMERS AWARENESS ON THE JUDICIOUS USE OF PESTICIDES AS A FIRST STEP IN THE PREVENTION OF WATER POLLUTION IN THE BLACK SEA BASIN

Liliana Panaitescu*, Simona-Mariana Pricop, Irina Moise, Daniela Jitariu

"Ovidius" University Constanţa, Faculty of Natural and Agricultural Sciences
124 Mamaia Boulevard, Constanţa, 900527, Romania,
**lilipanaitescu@yahoo.com*

ABSTRACT

In Romania, water protection against the pollution with sources from agriculture is reglemented by special laws. However, there is a poor dissemination among farmers, those who should be the first awared.

The information disseminated through the on-line means are not always available for all farmers. There are still farmers to whom the Iinternet acces is slow. In addition, the information existing on specialized sites are often presented with many details, the farmer being discouraged to access them.

We proposed that in the courses taught to the students from the specializations Agriculture and Horticulture - so future farmers, to introduce notions that raise the awareness degree of agricultural workers on the use of pesticides in crop protection against diseases and pests, judicious use of fertilizers or other substances that are commonly used to increase yield per hectare, in agreement with European and international law.

This paper presents the crops with high-risk degree on using pesticides that are possible water pollutants, as well as the measures required to prevent water pollution, both of the surface and groundwater.

***Key words**: water pollution, pesticides, farmers*

MATERIAL AND METHODS

This paper presents the main potentially polluting factors for soil, surface or ground waters. The authors identified the main potentially polluting crops technologies that influence the waters of the Black Sea basin and the main pesticides use in controlling weeds, diseases and pests. There are also presented possible polluting fertilizers used in agriculture.

Experts from the Intergovernmental Panel on climate evolution (GIEC) said in a report that "mankind destroy the nature biological diversity with a speed never seen before " or "every day literally disappearing 150 species of plants and animals" . Environmental protection of soil, water and crops, so our daily food is in everyone's attention, specialists or consumers.

In Romania it was implemented a "Code of Good Agricultural Practice". Thus, products used in plant protection are classified into two categories: products from Group III and IV of toxicity (mildly toxic) and products from Group I and II of toxicity (highly toxic and very toxic), used only by specialized and authorized personnel.

Table 1. Pesticides classification in groups of toxicity

Groups of toxicity	Efects	DL50 (mg/kg body)
I	Extremely strong	50
II	Highly toxic	50-200
III	Moderately toxic	200-1000
IV	With low toxicity	>1000

* by Good Agricultural Practice Guide

Due to the persistence of high toxicity in animals and humans, some pesticides have been banned by international conventions and by environmental protection legislation.

Examples of prohibited pesticides in Romania and abroad: Aldrin, DDT, Dieldrin (insecticides), Dinasel, Silvex (herbicides), Dibromocloropropan (fumigant).

RESULTS AND DISCUSSIONS

After analysis performed by specialists from the Department of Natural Sciences from the Faculty of Natural and Agricultural Sciences, Ovidius University of Constanta, there were identified the following species of cultivated plants, which through specific applied technologies can pollute waters in the Black Sea basin. These are presented in Table 2.

Table 2. Plant species identified to be cultivated in the Black Sea basin

Ref. no.	Species	Scientific name
1	Peppers	*Capsicum annuum L.*
2	Apricot tree	*Armeniaca vulgaris Lam. Sin. Prunus armeniaca* L.
3	Fiber hemp	*Cannabis sativa L.*
4	Strawberrie plant	*Fragaria viridis L.*
5	Potato	*Solanum tuberosum L.*
6	Onion	*Alliun cepa L.*
7	Cherry tree	*Prunus avium L.*
8	Beans	*Phaseolus vulgaris L.*
9	Sunflower	*Helianthus annuus L.*
10	Wheat	*Triticum aestivum vulgare L.*
11	Flax for oil	*Linum usitatissimum L.*
12	Lucerne	*Medicago sativa L.*
13	Apple tree	*Malus domestica*
14	Pea	*Pisum sativum L.*
15	Millet	*Panicum miliaceum L.*
16	Nectarines	*Prunus persica (L.) Batsch var. nucipersica*
17	Walnut	*Juglans regia L.*
18	Grain rice	*Oryza sativa L.*
19	Barley	*Hordeum vulgare L.*
20	Oats	*Avena sativa L.*
21	Pear tree	*Pyrus communis L.*
22	Melons	*Citrullus lanatus (Thunb.)*
23	Peach tree	*Prunus persica L.*
24	Maize	*Zea mays L.*
25	Plum tree	*Prunus domestica L.*
26	Rapeseed	*Brassica napus L.*
27	Rye	*Secale cereale L.*
28	Beets	*Beta vulgaris L.*
29	Soy	*Glicine hispida*
30	Sorghum	*Sorghum bicolor (L.) Moench ssp. bicolor*
31	Tomatoes	*Lycopersicon esculentum Mill. Solanum lycopersicum* L. var. *lycopersicum*
32	Triticale	*Triticum aestivum vulgare x Secale cereale L.*
33	Tobacco	*Nicotiana tabacum L.*
34	Garlic	*Allium sativum L.*
35	Cabbage	*Brassica oleracea L. Var. capitata*
36	Vine and vineyards	*Vitis vinifera L.*
37	Sour cherry tree	*Prunus cerasus L.*

Of these, the most common are: wheat, maize, sunflower, canola, peach, nectarine, apricot, cherry and sour cherry.

Pesticides identified as being most frequently used are shown in Table 3. It is noted that these pesticides are not included in groups I and II of toxicity.

Table 3. Pesticides used on Dobrogea's crops

Ref. no..	The main culture to which it applies pesticide	Active substance	The spectrum of activity	Crops that can also be applied pesticide
1	Wheat	tifensulfuron metil + tribenuron metil	Dicotyledonous weeds	Barley
2	Wheat	2,4D	*Bromus sp., Agropyron repens , Apera spica-venti, Sinapis arvensis, Thlaspi arvense.*	Barley
3	Wheat	Lambda-cihalotrin	*Aphids, thrips, straw's red worm, slabbering beetle, cereals' flies*	Barley
4	Corn	Lambda-cihalotrin	*Tanymecus dilaticollis Gyll*	Sunflower
5	Rape	Lambda-cihalotrin	*Phyllotreta atra, Phyllotreta nemorum and Psylliodes chrysocephala, Ceuthorrynchus napi şi Ceuthorrynchus assimillis, Athalia rosae, Meligethes aeneus, Brevicoryne brasicae, Pieris brassicae L., Mamestra brassicae*	
6	Wheat	propoxicarbazon-sodium	*Bromus sp., Agropyron repens , Apera spica-venti, Sinapis arvensis, Thlaspi arvense.*	
7	Fruit trees	ammonium glufosinate	*Dicotyledonous and monocotyledonous annual and perennial weeds*	Vineyard, Rice
8	Corn	isoxaflutol + tiencarbazon-metil + ciprosulfamide	*Amaranthus spp., Ambrosia spp., Anthemis arvensis, Atriplex patula, Capsella bursa-pastoris, Chenopodium spp., Cirsium arvense din samanta, Datura spp., Galinsoga parviflora, Galium aparine, samulastra de Helianthus annuus, Lamium purpureum, Matricaria spp., Plantago major, Polygonum spp., Portulaca oleracea, Sysimbrium officinale, Solanum nigrum, Stelaria media, Thlaspi arvense, Avena fatua, Digitaria spp., Echinochloa spp., Panicum spp., Setaria spp., Sorghum halepense from seed*	
9	Wheat	fluroxipir - meptil	*Capsella bursa-pastoris, Fumaria sp, Galium aparine, Polygonum convolvulus, Polygonum persicaria, Veronica officinalis*	Barley, Field corn

10	Cereals	Bromadiolon	*Field mouse, forest mouse, house mouse*	Fruit trees, nursery trees

Table 4. Pesticides of Group I of toxicity used in Romania

	Product/active substance	Category	Where to use
1	AGROXIN (Fosfura de aluminiu)	Rodenticides Molluscocides Repellent	Storages of agricultural products for gassing stored agricultural products: *Sythophilus spp., Tribolium confusum, Oryzaephilus surinamensis, Siltrotoga cerealella, Ephestia kuehniella*
2	DELICIA GASTOXIN (Fosfura de aluminiu)	Rodenticides Molluscocides Repellent	Storages of agricultural products for gassing stored agricultural products
3	DICARZOL 50 SP (Formetanate)	Insecticides	Field and greenhouses eggplants and tomatoes to combat tobacco thrips and common red mite
4	MAGTOXIN TABLETS (fosfura de magneziu)	Insecticides	Stored cereals
5	MEMENTO (Fenbutatin oxid)	Acaricides	Apple - red mite of trees; Soy and grapevine - common red spider
6	PHOSTOXIN (fosfura de aluminiu)	Insecticides	Storages of agricultural products for gassing stored agricultural products
7	QUICKPHOS-UP (Fosfura de aluminiu)	Insecticides	Main pests of stored cereals and of weevil at bean
8	VYDATE 10 G, VYDATE 10 L (oxamil)	Nematocides Disinfectants soil	Greenhouses and solariums tomatoes - the root's galicole nematode, greenhouse whitefly (larvae), *Solanaceae* mining bite; greenhouses and solariums cucumbers - tobacco thrips

Pesticides from Group I of toxicity are highly toxic to humans and animals, for which treatments are performed by specialized and certificated teams that operate with those products, equipped with standardized plant protection equipments and with first aid kits.

Applied according to indicated norms they destroy pests and can be used in any space that provides a correct treatment (silos, warehouses, containers), provided perfect precincts isolation and respecting the distance from the centers crowded with people and animals, and strict compliance with the recommended concentration. The final residual products are decomposing into equilibrium metabolites, being harmless for environment.

It is recommended their use in small doses, in order to not reach the groundwater.

The pesticides from Group II of toxicity are recommended to be used in low controlled doses, in order not to get into groundwater.

It is totally forbidden in farms to eliminate voluntarily waste and pesticide residues in ditches, sewers, surface water or farmland coming from excess spray liquid, washing machines, loss of spraying liquid during their supply or during technological operations, the unevenness distribution losses, packaging and containers that still contain pesticides which are discarded or improperly stored, liquid waste from baths immersion or bathing sheep, leaks from broken or cracked packages or containers, pesticides eliminated by expiration date.

Regarding the pollinating honeybees, billions of bees are dying in Europe and the bee population decreased considerably below the necessary number for the crops pollination, and in United States, in California for example - the largest food producer in USA - beekeepers lost 40% of hives each year.

Table 5. Pesticides from Group II of toxicity used in Romania

	Product/ active substance	**Category**	**Where to use**
1	AFALON 50 SC (linuron)	Herbicide	Potato, sunflower, corn - Dicotyledonous annual weeds
2	ALERT (Carbendazim, Flusilazol)	Fungicide	Wheat, barley, rape - foliar diseases, spike diseases, *Phoma lingam, Sclerotinia sclerotiorum, Botrytis cinerea, Alternaria sp., Erysiphe-graminis*
3	ALLEGRO	Fungicide	Wheat, barley - complex of foliar diseases
4	BARCLAY D-QUAT	Defolianţ and decsicant	Potato
5	BASTA 14 SL	Herbicide	Rice - desicant; vineyards and fruit trees - Dicotyledonous and monocotyledonous annual and perennial weeds
6	CAPALO	Fungicide	Wheat and barley – *Septoria spp, Puccinia spp, Erysiphe ssp., Fusarium spp, Helminthosporium spp, Pyrenophora spp, Rhynchosporium secale;*
7	COSMOS 250 FS	Fungicide	Wheat and barley - foliar and spike diseases – *Septoria spp, Puccinia spp, Erysiphe ssp., Fusarium spp, Helminthosporium spp, Pyrenophora spp, Rhynchosporium secale;*
8	DUETT ULTRA	Fungicide	Wheat and barley - foliar and spike diseases – *Septoria spp, Puccinia spp, Erysiphe ssp., Fusarium spp, Helminthosporium spp, Pyrenophora spp, Rhynchosporium secale;*
9	DURSBAN 480 EC	Insecticide	Potato – Leptinotarsa decemlineata; wheat – Eurygaster integriceps., beets - Bothynoderes punctiventris, Mamestra brassicae, Brevicoryne brassicae, vineyards - Lobesia botrana
10	KORIT 420 FS	Rodenticides Molluscocides, Repellent	Corn - bird repellent
11	LANNATE 20 SL, LANNATE 25 WP	Insecticide	*Helicoverpa armigera, Trialeurodes vaporariorum, Aphys pomi, Cydia pomonella, Cydia funebrana, Euritoma schreineri, Hoplocampa spp. Psilla spp. , Myzodes persicae, Cydia molesta, Rhagoletis cerasi, Hyphantria cunea*

12	LINUREX 50 SC	Herbicide	Potato, onion, sunflower, carrot, celery - Dicotyledonous and monocotyledonous annual weeds
13	MESUROL 500 FS	Insecticide	Corn - bird repellent , *Oscinella frit*
14	OPERA	Fungicide	Corn – *Helminthosporium spp.*
15	OPERA MAX	Fungicide	Wheat and barley - foliar and spike diseases – *Septoria spp, Puccinia spp, Erysiphe ssp., Fusarium spp, Helminthosporium spp, Pyrenophora spp, Rhynchosporium secale;*
16	OSIRIS	Fungicide	Wheat and barley - foliar and spike diseases – *Septoria spp, Puccinia spp, Erysiphe ssp., Fusarium spp, Helminthosporium spp, Pyrenophora spp, Rhynchosporium secale;*
17	PHOSFOROL	Insecticide	Main pests of stored cereals
18	PONCHO SOL 510 FS	Insecticide	Corn, sunflower – *Agriotes sp., Tanymecus dilaticollis*
19	REGLONE FORTE	Desiccant	Potato, sunflower, carrot, onion, rice, rape, beetroot - weeds, desicant; vita de vie - desicant
20	RUBRIC	Fungicide	Wheat, rye, triticale and barley - foliar and spike diseases – *Septoria spp, Puccinia spp, Erysiphe ssp., Fusarium spp, Helminthosporium spp, Pyrenophora spp, Rhynchosporium secale;*
21	SOPRANO 125 SC	Fungicide	Wheat, barley - Wheat and barley - foliar and spike diseases – *Puccinia spp, Erysiphe ssp., Fusarium spp.*
22	TANGO SUPER	Fungicide	Wheat, barley - *complex of* foliar diseases; Sugar beet – *Cercospora beticola, Peronospora farinosa f.sp. betae*

We are currently seeing an "ecological holocaust" that puts us all in jeopardy: without pollination, most plants and a third of our food are in danger.

Attention should be drawn regarding the use of pesticides that are toxic to bees and other pollinators. It comes to the use of sunflower seed treated with insecticides from neonicotinoids class after the temporary authorizations issued by the Ministry of Agriculture and Rural Development - Romania in 2015. There is a deep concern about the overall state of beekeeping in Romania, especially after the state of calamity that characterized 2014, that are likely to enter in a decline process.

It is considered that the additional risk factors such as the use of neonicotinoids for seeds treatments of canola, sunflower and maize represents a danger that beekeeping cannot afford given that this plant treatment is banned in the European Union. The position of Romanian associations and federations with beekeeping profile was from the beginning in support of Romania's alignment to current trends in Europe, favoring agricultural production methods that take into account environment and pollinators.

Severe effects can occur in the practice of using neonicotinoids in specific season farming for sunflower and maize crops. Sowing seed treated with neonicotinoids in farmlands within flying range of bees can levitate contaminated dust that lay on the ground; the first rain can incorporated them in water puddles in which honeybees sometimes drink. The existence of corn and sunflower seedlings already occurred in the 2-3-leaf can result in the acute toxicity of the bees.

Sublethal effects caused by the bees harvest of treated oilseed rape nectar and pollen attest depopulation with various amplitudes, due the lost of honeybees, that cannot manage their return to the hive due to the damaged of their memory and navigation capacity.

Involutions of bee colonies in periods that follow the treated oilseed rape harvest can be noticed due to reduced capacity of brood growth, the damage of communication between bees and of the immune system for the whole super-organism represented the bee colony. Consumption of honey and bee bread by bees may extend this situation for relatively long periods.

CONCLUSIONS

After the analysis performed by specialists from the Department of Natural Sciences from the Faculty of Natural and Agricultural Sciences, "Ovidius" University of Constanta, Romania, a total of 37 species of cultivated plants, possibly polluting the waters of the Black Sea basin, have been identified.

Eight pesticides have been identified belonging to the Group I of toxicity used especially in deposits, but also for tomatoes from greenhouses and solariums - galicol nematode of roots, greenhouse whitefly (larvae), *solanaceae* mining bite; greenhouses and solariums cucumber - tobacco thrips.

In Romania, a Code of Good Agricultural Practice was implemented. Thus, products used in plant protection are classified into two categories: products from Group III and IV of toxicity (mildly toxic) and products from Group I and II of toxicity (highly toxic and very toxic), used only by specialized and authorized personnel. 22 pesticides belonging to Group II of toxicity were identified, used mainly to control diseases, pests and weeds, for all of the 37 species of agricultural plants, whose technologies were identified as potentially polluted of Black Sea basin waters.

The position of Romanian associations and federations with beekeeping profile was from the beginning in support of Romania's alignment to current trends in Europe, favoring agricultural production methods that take into account environment and pollinators. Serious effects can occur by using neonicotinoids in the practice of specific farming for sunflower and maize crops.

REFERENCES

A. Bavaru, Rodica Bercu, Protejarea mediului, a resurselor sale - o sansa pentru viata, Editura Arhiepiscopiei Tomisului, Constanta, 2014

2. F. Vosniakos, T. Almpanis, G. Vasilikiotis, K. Diamantopoulos, E. Christoforidou, A. Karida, K. Zavlaris, P. Metzelou, D. Lampropoulou, 2007, Evaluation of transboundary pollution levels in the Axios river (Greece, Former Yugoslavian Republic of Macedonia) - direct and indirect impacts on man and environment, Journal of Environmental Protection and Ecology 8, No 3, 526–534, 2007

3. A. Paparisto, E. Halimi, E. Hamzaraj, O. Laknori, E. K, 2010, Risk assessment for correspondence. Identification of invasive insects in Albania and the assessment of

their potential impact to the country biodiversity, Journal of Environmental Protection and Ecology 11, No 1, 95–111, 2010
4. G. E. Budge, D. Garthwaite, A. Crowe, N. D. Boatman, K. S. Delaplane, M. A. Brown, H. H. Thygesen & S. Pietravalle, 2015- Evidence for pollinator cost and farming benefits of neonicotinoid seed coatings on oilseed rape, http://www.nature.com/; http://www.nature.com/articles/srep12574
5. Randy Oliver, 2012- Neonicotinoids: Trying to Make Sense of the Science, American Bee Journal, http://www.americanbeejournal.com/
6.***CODE OF GOOD PRACTICE FOR THE AGRICULTURAL FARMERS