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О. Шевченко, канд. біол. наук, С. Петренко, пров. інж.,
О. Іутинська, канд. біол. наук, А. Бисов, канд. біол. наук. Т. Шевченко, канд. біол. наук
Київський національний університет ім. Тараса Шевченка, Київ, Україна

ПОШИРЕННЯ ВІРУСУ МОЗАЇКИ ТУРНЕПСУ У СПРИЙНЯТЛИВИХ КУЛЬТУРНИХ РОСЛИНАХ СИЛЬНО ЗАЛЕЖИТЬ ВІД РІЗНИХ ПІДХОДІВ ДО ВИРОЩУВАННЯ

Зразки рослин с симптомами вірусу мозаїки турнепсу (TuMV) відбиралися с промислових полів вирощування хрестоцвітих культур у Київській обл. та на різних ділянках у місті Києв. TuMV був знайдений на всіх промислових полях, приватних присадибних ділянках та міських ділянках, а сумарний рівень інфекцій становив 50%. У даній роботі описуються наслідки застосування різних агроекологічних прийомів для поширення вірусу у сприйнятливих культурах та підтверджена важливість профілактичних заходів у боротьбі з вірусними хворобами.

Ключові слова: вірусу мозаїки турнепсу, вирощування хрестоцвітих культур.

А. Шевченко, канд. биол. наук, С. Петренко, вед. инж., О. Иутинская, канд. биол. наук,
А. Бисов, канд. биол. наук, Т. Шевченко, канд. биол. Наук
Киевский национальный университет им. Тараса Шевченко, Киев, Україна

РАСПРОСТРАНЕНИЕ ВИРУСА МОЗАИКИ ТУРНЕПС У ВОСПРИИМЧИВЫХ КУЛЬТУРНЫХ РАСТЕНИЯХ СИЛЬНО ЗАВИСИТ ОТ РАЗНЫХ ПОДХОДОВ К ВЫРАЩИВАНИЮ

Образцы растений с симптомами вируса мозаики турнепса (TuMV) отбирались с промышленных полей выращивания крестоцветных культур в Киевской обл. и на различных участках в городе Киев. TuMV был найден на всех промышленных полях, частных приусадебных участках и городских участках, а суммарный уровень инфекций составил 50%. В данной работе описываются последствия применения различных агроэкологических приемов для распространения вируса в восприимчивых культурах и подтверждено важность профилактических мероприятий в борьбе с вирусными болезнями.

Ключевые слова: вируса мозаики турнепса, выращивание крестоцветных культур.

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V. Solomakha, DSc., N. Smoliar, PhD.,
O. Smagliuk, PhD stud.
Taras Schevchenko National University of Kyiv, Kyiv, Ukraine

FLORISTIC CLASSIFICATION OF THE FLOODPLAIN ALDER, WILLOW AND POPLAR FORESTS IN THE BASIN OF THE LOWER SULA (UKRAINE)

The floodplain alder (Alnus glutinosa), willow (Salix alba, rarely S. fragilis) and poplar (Populus nigra, P. alba, outliers of Populus x canescens) forests in the basin of the lower Sula were investigated. Mesohygrophilous forests of European black alder were referred to Alno-Ulmion alliance Querco-Fagetea class (com. Aegopodium podagraria-Alnus glutinosa, D. c. Acer negundo-Alnus glutinosa). Swamp forests of European black alder of Alnetea class are mostly common in the floodplains of small rivers and are represented by two associations (Carici ripariae-Alnetum glutinosae and Carici acutiformis-Alnetum glutinosae). The floodplain willow and poplar forests were referred to class Populetea albae (order Populetalia albae). Willow forests of floodplains of the river Sula and its tributaries and also waterlogged gully talwegs and rarely outliers belong to Salicion albae alliance and Salicetum albae association. Lower reach poplar forests of the river Sula floodplain belong to Calamagrostio epigei-Populion nigrae alliance and are divided into two associations that we propose to change in accordance with the requirements of the International Code of Phytosociological Nomenclature for Galio veri-Populetum nigrae and Strophiostomo sparsiflorae-Populetum albae. It is emphasized that the studied groups don't contain the species from the Red Data Book of Ukraine. The alder, willow and poplar forests of each association that are least transformed, largest in area and oldest require the nature reserve creation, that is proved by their significant water conservation role.

Key words: Querco-Fagetea (Alno-Ulmion), Alnetea, Populetea albae, Ukraine, Dnieper left-bank Forest-Steppe, basin of the lower Sula, syntaxonomy.

Introduction. The floodplain alder (*Alnus glutinosa* (L.) P. Gaertn.), willow (*Salix alba* L., rarely *S. fragilis* L.) and poplar (Po*pulus nigra* L., *P. alba* L.*, Populus* x *canescens* (Ait.) Smith. forests are located throughout the whole region of our research of the floodplain of Sula river and its brances, however on the left bench they are less numerous. Accumulation and generalization the data about its phytocoenotic diversity according to the methodology of

G.Brown-Blanche school have been conducted for the last decades [1, 4-5, 6, 9, 12-14]. The results were included and critically processed in the monograph dedicated to the classification of the Northern Black Sea area forests [10].

Concerning the basin of Sula river, floristic and syntaxonomic content of flooded forest is not studied enough. We continued and detalized the study of flooded forests according to the methodology of G.Brown-Blanche school. These researches are important considering the fact that such forests have significant water preservation value and make up important resource of its ecological network. Also, the most part of the forests has been cut down or transformed. Integrating new phytocoenotic material into scientific use will help to solve the problems of ecology – floristic classification of willow, poplar and alder forests of the Forest-Steppe region of Ukraine.

Physical and geographical features of the researched object. The lower Sula basin is situated in Pridniprovskiy lowlands between Poltava and Cherkasy administrative regions. It spreads from the confluence of Udai river (northern part of Lubny city) into the mouth of Sula. Now it is flooded by the waters of Kremenchug reservoir. The main branches of this part of the river are Sliporid and Orgytsa and both of them flow into Sula from the right side. Basin of the Sula river is situated within Obolon-Gradyz physical-geography region.

The main feature of lower Sula basin climate is gradual decrease of the amount of precipitations in eastern and southern directions, which is about 500 mm per year. Average year temperature estimated about +6ºC. The relief is represented by reduced plain with integrated left tributaries of the Dnieper throughout the area. Flooded poplar, willow and alder forests are located throughout the whole region of our ivestigation of the floodplain of Sula river and its brances, however on the left bench they are less numerous. They are characterized by mostly short term flood regime, however during the last decade, the flood has became a rare phenomenon for this area. Their hydrological regime significantly impacted drainage reclamation, which covered most of the floodplains of small rivers and flood waters Kremenchug reservoir, resulting in decreased fluctuation amplitude of the water level and alluvium deposits.

Materials and methods. 74 geobotanical descriptions were used in this work, 53 of them were made by O.Yu. Smagliuk in the valley of lower Sula and its branches in 2014-2015 and 21 descriptions of N.O.Smoliar during shared expedition in 2015.

The descriptions were performed and processed according to the methodology of G.Brown-Blanche school [8]. The size of descriptive area was about 25x25m, sometimes the area was within natural phytocenotic boundaries if the area was small or striped. During the processing, part of descriptions were discarded as transitions between different sub-associations. Abundance points given in the table correspond to the following indexes of projective cover: + – < 1%, 1 – 1-5%, 2 – 6-15%, 3 – 16-25%, 4 – 26-50%, 5 – 51-100%. Points of permanence denote: + – < 10%, I – 10-20%, II – 21-40%, III – 41-60%, IV – 61-80%, V – 81-100%. Layering is shown in parentheses after the name of species of trees and bushes: a – the top wood tier; b – shrub tier; c – grass tier. The names of the species are given according to S.L.Mosyakin and M.M. Fedoronchuk [15].

Results and discussions

Syntaxon layout of flooded willow, poplar and alder forests of the lower Sula basin

Cl. **Querco-Fagetea** Br.-Bl. et Vlieger 1937
Ord. **Fagetalia sylvaticae** Pawl. in Pawl., Sokol. et Wall. 1928
All. **Alno-Ulmion** Br.-Bl. et R.Tx. 1943
Com. **Aegopodium podagraria-Alnus glutinosa** (Alno-Ulmion)
D.c. **Acer negundo-Alnus glutinosa** (Alno-Ulmion)
Cl. **Alnetea glutinosae** Br.-Bl. et R.Tx. 1943 em Mull. et Gors 1958
Ord. **Alnetalia glutinosae** R.Tx. 1937 em Mull. et Gors 1958
All. **Sio latifolii-Alnion glutinosae** Vorobyov & I. Solomakha in I. Solomakha 2015
Ass. **Carici ripariae-Alnetum glutinosae** Weisser 1970
Ass. **Carici acutiformis-Alnetum glutinosae** Scamoni 1935
Cl. **Populetea albae** Br.-Bl. 1962
Ord. **Populetalia albae** Br.-Bl. 1931
All. **Salicion albae** Klika 1955
Ass. **Salicetum albae** Klika 1955
Subass. **S.a. aegopodietosum podagrariae** subass.prov.
Subass. **S.a. urticetosum galeopsifoliae** subass.prov.
Subass. **S.a. caricetosum acutiformis** subass.prov.
Com. **Ulmus glabra-Salix alba** (Salicion albae)
All. **Calamagrostio epigei-Populion nigrae** (Shevchyk et Solomakha 1996) Shevchyk et V.Solomakha in I.Solomakha et. al. 2015 in nomen novum (Nomenkl. synon. Rubo caesii-Amorphion fruticosae Shevchyk et V.Solomakha 1996; syntax. synon. Galio veri-Aristolochion clematidis Shevchyk et V.Solomakha 1996)
Ass. **Galio veri-Populetum nigrae** nom. nov. prov. (Syn. Galio veri-Aristolochietum clematidis Shevchyk et V.Sl. 1996)
Ass. **Strophiostomo sparsiflorae-Populetum albae** nom. nov. prov. (Syn. Strophiostomo sparsiflorae-Amorphetum Shevchyk et V.Sl. 1996)
Com. **Swida sanguinea-Populus x canescens** (Calamagrostio epigei-Populion nigrae)
Com. **Carex hirta-Populus balsaminus** (Calamagrostio epigei-Populion nigrae)

Characteristic of marked syntaxons

All descriptions of willow forests in the lower Sula basin are summarized in one table (Table 1). They are divided into two classes – **Querco-Fagetea** and **Alnetea glutinosae.** The first one includes mostly drained alder populations of nemorial type. Because of its defect, the associations were not identified and only two groups were separated. Swampy black-alder forests classified as **Alnetea glutinosae**, which includes two associations. Overall, associations of alder forests are richer than willow forests in terms of floristic content but less rich than poplar forests.

***Table* 1. Phytocenotic characteristic of alder forests of lower Sula basin**

Desnity of wood tier	09	07	06	10	07	06	07	06	08	07	09	09	08	06	03	05	–
Density of shrub tier	01	01	03	01	02	+	04	04	+	+	+	02	+	+	+	+	04
Projective cover of grass tier	90	80	75	25	95	30	20	65	85	85	90	85	95	55	90	25	90
Amount of species described	16	29	24	15	21	13	14	25	19	12	27	15	16	14	20	23	24
Number of description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
D.s. Com. Aegopodium podagraria-Alnus glutinosa																	
Corylus avellana (b)	1	.	3	.	.	.	.	.	.	.	.	.	.	.	.	+	+
Corylus avellana (c)	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Euonymus europaea (c)	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aegopodium podagraria	5	5	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Asarum europaeum	1	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Stellaria holostea	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pulmonaria obscura	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Stachys sylvatica	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
D.s. D.c. Acer negundo-Alnus glutinosa																	
Acer negundo (a)	.	.	.	5	2	.	.	.	.	.	.	.	.	.	.	.	.
Acer negundo (b)	.	.	.	1	+	+	.	3	1	.	.	+	.	.	.	.	+
Acer negundo (c)	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.
Ulmus laevis (a)	1	.	.	.	3	2	.	.	.	.	.	.	.	.	.	.	.
Ulmus laevis (b)	.	.	.	.	.	+	1	2	.	.	.	.	.	.	.	+	+
Acer platanoides (b)	.	.	2	.	.	.	2	.	.	.	.	.	.	.	.	.	+
Geum urbanum	.	.	.	+	+	+	.	+	.	.	+	.	.	.	.	.	+
Anthriscus sylvestris	.	.	.	1	.	.	.	+	.	.	.	.	+	.	.	.	.
Poa nemoralis	.	.	.	.	2	+	.	.	.	.	.	.	.	.	.	.	.
Festuca gigantea	.	.	.	+	+	.	.	.	+	.	.	.	.	.	.	.	.
D.s. All. Alno-Ulmion (Cl. Querco-Fagetea)																	
Salix alba (a)	.	1	.	.	.	1	.	1	.	.	.	.	.	.	.	1	.
Fraxinus excelsior (a)	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.
Fraxinus excelsior (c)	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Quercus robur (a)	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Quercus robur (c)	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ulmus glabra (a)	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ulmus glabra (b)	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ulmus carpinifolia (c)	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tilia cordata (b)	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	.
Tilia cordata (c)	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Padus avium (b)	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Acer campestre (b)	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Acer tataricum (b)	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Swida sanguinea (b)	.	.	1	+	2	.	.	.	.	.	1	.	.	+	.	.	.
Viburnum opulus (b)	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.
Acer platanoides (c)	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rubus caesius	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Ficaria verna	+	1	1	1	5	.	+	.	.	.	.	.	.	.	.	.	.
Adoxa moschatellina	2	.	1	.	.	2	.	.	.	.	.	.	.	.	.	.	.
Lamium maculatum	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Gagea minima	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anemonoides ranunculoides	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Corydalis cava	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Corydalis solida	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Gagea lutea	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Scilla siberica	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Paris quadrifolia	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Cardamine amara	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Crysosplenium alternifolium	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Geum rivale	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Polygonatum multiflorum	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Millium effusum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Urtica dioica	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.
Frangula alnus (b)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Scrophularia umbrosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
D.s. Ass. Carici ripariae-Alnetum glutinosae																	
Sambucus nigra (b)	1	1	.	.	.	.	+	1	1	.	.	3	1	.	.	.	.
Sambucus nigra (c)	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Glechoma hederacea	+	.	+	1	.	+	.	.	1	.	1	+	2	.	.	.	.
Chelidonium majus	.	.	.	.	.	+	.	+	.	.	.	+	+	.	.	.	.
Geranium robertianum	.	.	.	.	.	+	.	+	.	.	.	1	.	.	.	.	.
Myosoton aquaticum	.	.	.	.	.	.	.	+	1	.	+	1	+	.	.	+	.
Eupatorium cannabinum	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.
Cirsium oleraceum	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Coccyganthe flos-cuculi	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Myosotis sparsiflora	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.

Ending tabl.1

Desnity of wood tier	09	07	06	10	07	06	07	06	08	07	09	09	08	06	03	05	–
Density of shrub tier	01	01	03	01	02	+	04	04	+	+	+	02	+	+	+	+	04
Projective cover of grass tier	90	80	75	25	95	30	20	65	85	85	90	85	95	55	90	25	90
Amount of species described	16	29	24	15	21	13	14	25	19	12	27	15	16	14	20	23	24
Number of description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
D.s. Ass. Carici acutiformis-Alnetum glutinosae																	
Salix cinerea (b)	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+
Carex acutiformis	.	.	.	.	+	.	.	+	.	.	.	.	.	4	4	3	+
Lycopus exaltatus	.	.	.	.	.	.	.	+	.	.	.	.	.	+	+	+	.
Filipendula ulmaria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+
Carex pseudocyperus	.	.	.	.	.	.	.	.	.	.	1	.	.	.	+	+	.
Stachys palustris	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	+	.
D.s. All. Sio latifolii-Alnetum glutinosae																	
Carex riparia	+	.	.	.	.	.	+	.	3	1	2	+	1	2	+	.	5
Galium aparine	.	.	1	.	+	2	+	5	2	1	2	5	5	.	.	.	+
Humulus lupulus	+	.	+	.	.	+	+	.	1	+	1	1	1	1	+	+	+
Symphytum officinale	.	.	.	.	.	.	.	+	+	.	+	+	+	.	+	+	.
D.s. Cl. Alnetea glutinosae																	
Alnus glutinosa (a)	5	5	4	2	3	4	5	4	5	5	5	5	5	4	3	4	.
Alnus glutinosa (b)	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	3
Ribes nigrum (b)	.	.	.	.	1	.	3	.	.	+	+	1	.	.	.	.	2
Ribes nigrum (c)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Salix pentandra (b)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Urtica galeopsifolia	3	3	5	1	+	.	2	+	2	5	3	2	1	1	+	.	3
Impatiens noli-tangere	2	.	2	+	4	.	2	.	5	1	5	.	3	+	+	.	.
Thelypteris palustris	.	.	+	.	+	.	.	.	2	1	.	.	+	1	5	1	.
Equisetum fluviatile	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	1	+
Lysimachia vulgaris	.	.	.	.	.	.	.	+	+	.	.	+	.	.	+	+	.
Dryopteris carthusiana	+	.	+	.	+	.	+	.	.	.	.	.	.	+	+	.	.
Phragmites australis	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Solanum dulcamara	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Caltha palustris	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Galium palustre	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.

Rarely occurred species: *Acorus calamus* (8 – +), *Agrostis canina* (11 – 1), *Alopecurus ventricosus* (8 – +), *Angelica sylvestris* (5, 17 – +), *Arctium lappa* (11 – 1), *A. minus* (8 – +), *Ballota nigra* (8 – 1), *Betula pubescens* (a) (16 – 1), *Carex acuta* (11 – +), *Carex appropiquata* (11 – +), *Chaerophyllum temulum* (4 – +), *Cirsium acanthoides* (5 – +), *C. arvense* (17 – 1), *Dipsacus strigosus* (5, 16 – +), *Elytrigia repens* (11 – +), *Epilobium roseum* (17 – +), *Equisetum palustre* (9 – 1, 11 – +), *Euonymus europaea* (b) (17 – +), *Galeopsis bifida* (9 – 1), *Geum allepicum* (9 – +), *Glechoma hirsuta* (14 – +), *Impatiens parviflora* (10 – 1), *Lycopus europaeus* (11 – +), *Lysimachia nummularia* (16 – +), *Lythrum salicaria* (13, 17 – +), *Moehringia trinervia* (1 – +), *Poa remota* (10 – +), *Populus alba* (a) (16 – 1), *Ranunculus repens* (16 – +), *Salix aurita* (b) (10, 16 – +), *Salix fragilis* (a) (12 – 1), *Scirpus sylvaticus* (11 – 1), *Sorbus aucuparia* (c) (11 – 1), *Sium latifolium* (2 – +), *Typha latifolia* (17 -1), *Ulmus carpinifolia* (a) (11 – 1).

Legend for descriptions

Description 1. N.O. Smoliar 25.05.2015. Flooded forest between villages Bilousivka and Kozorizi (Cherkasy region Drabivsky district).

Description 2. O.Yu.Smagliuk 30.04.2015. Mixed deciduous forest in the "Morozivska dacha" in the outscirts of Lubny city in the valley of meandering stream. Diameter of alder 0.3 m, poplar – 0,5 m, willow – 0,6 m, height of 27 m.

Description 3. O.Yu.Smagliuk 25.05.2015. Alder on the floodplain of Chumgak between villages Bilousivka and Kozorizi. Alder diameter 0,6-0,7 m, height of 28 m.

Description 4-5. O.Yu.Smagliuk 23.05.2014. Transformed alder swamp in the lowland of floodplain of Orzhytsa river (Poltava region, village Zolotuhi, Orzhytsia destrict).

Description 6. O.Yu.Smagliuk 03.05.2014. In the terrace reduction of Sula river valley (Poltava region, Velykoburimske forestry).

Description 7. O.Yu.Smagliuk 08.05.2014. On the floodplain. Orzhitsa at the indigenous banks (Poltava region, Orzhytske forestry).

Description 8. O.Yu.Smagliuk 24.05.2014. On the floodplain of Sula (Poltava region, between the villages, Velykoselytske and Maloselytske, Orzhytsia destrict).

Description 9-12. O.Yu.Smagliuk 25.05.2015. In alder floodplain of Chumgak river near Bilousivka village. Alder diameter 0,35-0,4 m, height 20 m.

Description 13. O.Yu.Smagliuk 25.05.2015. In the alder forest on the floodplain of Gnyla river near village Rudka) (Poltava region, Hrebinka destrict). The diameter of alder 0,3 m, height is 23 m.

Description 14. O.Yu.Smagliuk 23.05.2014. In lowland with wet soil on the floodplain of Sliporid river (Poltava region, near the villages Novoselivka-Pryymivschyna-Voronyntsi).

Description 15. O.Yu.Smagliuk 08.05.2014. On floodplain of Orzhutsia river, far from the root bench (Poltava region, Orzhytske forestry)

Description 16. O.Yu.Smagliuk 03.05.2014. On the floodplain of Sula river near the root bench (Poltava region, Velykoburimske forestry).

Description 17. O.Yu.Smagliuk 08.05.2014. In the deforestation zone of the floodplain of Orzhytsia river (Poltava region, Orzhytske forestry).

Aggregation **Alno-Ulmion** includes hygrophyllic deciduous forests. On the research territory it is introduced by frequently transformed communities as a result alder drainage. As a result of peat decomposition and nutrients enrichment we can observe the increase of nemorial mesophytes and nitrophilic species, and also increasing of alder populations. Diagnostic list represents its differentiation from swampy alder forests.

Aggragation **Aegopodium podagraria-Alnus glutinosa** (Alno-Ulmion) represented by old natural forests with tree diameter 0,6-0,7 m 27-28 m heigh. Widely spread on the floodplains of the streams and small rivers among the mas-

sives of deciduous forests. Insufficient amount of descriptions does not allow to include the aggregation to a separate association but allows to classify them to associations of **Ficario-Ulmetum** Knapp ex Medwecka-Kornas 1952 **or Rubo caesii-Alnetum** Bajrak 1997 because of difference of its floristic content. Average density of wood tier is 0,7, shrub – 0,2, grass tier coverage – 80%. index of floristic diversity of the groups is the highest among alder forests.

Derivative group **Acer negundo-Alnus glutinosa** (Alno-Ulmion) distributed on the floodplains of Orzhetsia and Sula rivers, and introduced by drained alder forests (swamped before) where *Acer negundo* L. growed. Such groups are found in the valley of river Chorol [6]. Average density of wood tier estimates 0,7, shrub – 0,2, grass tier coverage – 50%.

Association of **Sio latifolii-Alnion glutinosae** is represented by alder swamps of Forest-Steppe and Steppe areas with the most nutrient rich soils [10]. On the researched area, aggregations contain many species of flooded alder and poplar forest class **Populetea albae**. On the research area there were no aggregations of **Alnion glutinosae** (Malc. 1929) Meijer Drees 1936 s. str., association which is typical for forest zone. Average density of wood tier is higher than alder – 0,75, shrub – less (0,1), grass tier coverage – 80%.

Association of **Carici ripariae-Alnetum glutinosae** is distributed on the floodplains of small rivers – right branches of Sula and represented by mild humidity alder forests with vivid features of nitrification. It occupies the largest territories of the alder forests of the region. Micro relief is often not observed Hygro- and hygrophytes are represented poorly. Average density of wood tier estimates 0,8, shrub – 0,1, grass tier coverage – 85%.

Association of **Carici acutiformis-Alnetum glutinosae** is distributed on the lowlands of river Sula and its right branches, floodplains represents well humidified and peated alder forests without signs of nitrification. Micro relief is expressed well enough. Association is rarely occurred and needs preservation because part of its aggregations have been transformed into previous association. Average density of wood tier is minor C – 0,45, shrub – 0,1, grass tier coverage is less than in the previous association – 65%.

Class **Populetea albae**

During the last decade, aggregation of flooded alder and poplar forests are considered to belong to the class **Salicetea purpureae** Moor 1958. But not much time ago alder and poplar forests were attributed to forgotten class **Populetea albae** Br.-Bl. 1962 [10]. We support the division of wood and shrub aggregations on the level of classes. Flooded alder and poplar forests of the researched region are divided into two big groups which correspond to the unions – meso hygrophyllic and more nutritious aggregations of loamy soil with predominance of *Salix alba* and xeromesophyllic short term flooded aggregations of loam and sandy soils with a predominance of *Populus* L. Description of white willow forests from **Salicion albae** union of the lower Sula basin are summarized in a separate table (Table 2)

***Table 2*. Phytocenotic characteristic of willow forests of lower Sula basin**

Desnity of wood tier	07	06	08	07	07	08	06	06	07	06		06	06	04	06	04	10	06	09
Density of shrub tier	–	05	06	–	03	02	03	03	+	+		02	03	+	+	02	+	03	08
Projective cover of grass tier	50	99	90	70	75	75	75	85	80	80		65	60	90	70	65	3	70	2
Amount of species described	17	20	20	10	17	14	29	11	21	26		25	17	16	18	9	25	25	22
Number of description	1	2	3	4	5	6	7	8	9	10		11	12	13	14	15	16	17	18
D.s. Subass. S.a. aegopodietosum podagrariae subass.prov.																			
Ficaria verna	4	+	5	4	.	.	.	.	.	.		.	.	.	.	.	.	.	.
Aegopodium podagraria	.	5	4	3	.	.	.	.	.	.		.	.	.	.	.	.	.	.
Urtica dioica	+	.	2	1	+	.	.	.	.	.		.	2	.	.	.	.	.	+
Geum urbanum	+	.	.	.	+	2	.	.	.	.		.	.	.	.	.	.	.	.
Anemonoides ranunculoides	.	1	3	+	.	.	.	.	.	.		.	.	.	.	.	.	.	.
Pulmonaria obscura	.	+	+	.	+	.	.	.	.	.		.	.	.	.	.	.	.	.
Adoxa moschatellina	.	1	+	.	.	.	.	.	.	.		.	.	.	.	.	.	.	.
Scilla bifolia	.	.	.	2	.	.	.	.	.	.		.	.	.	.	.	.	.	.
Arctium lappa	+	.	+	+	.	.	.	.	.	.		.	.	.	.	.	.	.	.
Asarum europaeum	.	+	+	.	+	.	.	.	.	.		.	.	.	.	.	.	.	.
Galeobdolon luteum	.	.	1	.	5	.	.	.	.	.		.	.	.	.	.	.	.	.
Lamium maculatum	.	+	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.	.
Festuca gigantea	+	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.	.
Stellaria holostea	.	+	.	.	+	.	.	.	.	.		.	.	.	.	.	.	.	.
D.s. Subass. S.a. urticetosum galeopsifoliae subass.prov																			
Salix triandra (b)	.	.	.	.	.	4	.	.	.	.		.	.	.	.	.	.	.	.
Acer negundo (c)	.	.	.	.	.	.	1	.	.	+		.	.	.	.	.	.	.	.
Fraxinus excelsior (c)	.	.	.	.	.	.	+	.	+	+		.	.	.	.	.	.	.	.
Rubus caesius	.	.	.	.	.	.	3	+	.	+		+	.	.	.	.	1	5	1
Urtica galeopsifolia	.	1	.	.	.	3	5	5	5	4		.	.	.	.	.	.	.	.
Impatiens noli-tangere	.	1	.	.	.	4	1	2	1	1		.	.	.	.	.	.	.	.
Symphytum officinale	.	.	.	.	.	.	+	+	1	2		.	.	.	.	.	+	+	.
Caltha palustris	.	.	.	.	.	.	+	+	3	1		.	.	.	.	.	.	.	.
Carex pseudocyperus	.	.	.	.	.	.	+	+	.	1		.	.	.	.	.	.	.	.
Iris pseudacorus	.	.	.	.	.	.	+	+	+	+		.	.	.	.	+	.	.	.
Thelypteris palustris	.	.	.	.	.	.	+	.	1	.		.	.	.	.	.	.	.	.
Glechoma hederacea	.	.	.	.	.	+	+	.	.	.		+	.	.	.	.	+	2	+
Humulus lupulus	.	.	.	.	.	.	+	.	.	1		.	.	.	.	.	.	.	.
Filipendula ulmaria	.	.	.	.	.	.	+	.	.	1		.	.	.	.	.	.	.	.
Urtica kioviensis	.	.	.	.	.	.	.	.	2	4		.	.	.	.	.	.	.	.
Lycopus exaltatus	.	.	.	.	.	.	.	.	1	+		.	.	.	.	.	.	.	.
Phalaroides arundinacea	.	.	.	.	.	.	.	.	+	1		.	.	.	.	.	.	+	+
Mentha pulegium	.	.	.	.	.	.	.	.	+	+		.	.	.	.	.	.	.	.
Galium palustre	.	.	.	.	.	.	+	.	.	.		.	.	.	.	+	.	.	.

Ending tabl. 2

Desnity of wood tier	07	06	08	07	07	08	06	06	07	06		06	06	04	06	04	10	06	09
Density of shrub tier	–	05	06	–	03	02	03	03	+	+		02	03	+	+	02	+	03	08
Projective cover of grass tier	50	99	90	70	75	75	75	85	80	80		65	60	90	70	65	3	70	2
Amount of species described	17	20	20	10	17	14	29	11	21	26		25	17	16	18	9	25	25	22
Number of description	1	2	3	4	5	6	7	8	9	10		11	12	13	14	15	16	17	18
D.s. Subass. S.a. caricetosum acutiformis subass.prov.																			
Carex acutiformis	.	.	.	.	.	.	.	.	2		2	4	3	5	4	5	.	.	.
Phragmites australis	.	.	.	.	.	.	.	.	.		+	2	4	1	+	.	.	+	.
Scutellaria galericulata	.	.	.	.	.	.	.	.	+		+	.	.	+	1	.	.	.	.
Lythrum salicaria	.	.	.	.	.	.	.	.	1		.	+	.	.	+	1	.	.	+
Lysimachia vulgaris	.	.	.	.	.	.	.	.	.		.	.	.	+	+	.	.	+	+
Ranunculus repens	.	.	.	.	.	.	+	.	+		+	+	.	+	.	.	.	.	.
Vicia cracca	.	.	.	.	.	.	.	.	.		.	+	.	+	+	.	.	.	.
Eupatorium cannabinum	.	.	.	.	.	.	.	.	.		.	2	+	.	.	.	.	+	.
Lycopus europaeus	.	.	.	.	.	.	.	.	.		.	.	+	2	1	.	.	.	.
Calystegia sepium	.	.	.	.	.	.	.	.	.		.	+	.	2	2	.	.	.	.
Agrostis stolonifera	.	.	.	.	.	.	.	.	.		.	.	2	1	1	.	+	+	.
Glyceria maxima	.	.	.	.	.	.	.	.	.		.	.	.	2	+	.	.	.	.
Bidens tripartite	.	.	.	.	.	.	.	.	.		.	+	2	.	.	.	.	.	.
Mentha arvensis	.	.	.	.	.	.	.	.	.		.	.	.	2	2	.	.	.	.
Cirsium arvense ssp. *Setosum*	.	.	.	.	.	.	.	.	.		.	.	.	.	1	.	.	+	.
Teucrium scordium	.	.	.	.	.	.	.	.	.		.	.	.	.	.	1	.	.	.
D.s. Subass. S.a. aegopodietosum podagrariae & S.a. urticetosum galeopsifoliae																			
Ulmus laevis (a)	1	.	.	2	.	.	1	.	.		.	.	.	.	.	.	.	.	.
Ulmus laevis (b)	.	.	.	.	.	.	.	+	.		.	.	.	.	.	.	1	.	.
Acer negundo (a)	4	.	2	.	.	.	.	.	.		1	.	.	.	.	.	.	2	.
Acer negundo (b)	.	2	4	.	.	1	.	.	.		.	.	.	.	.	.	.	1	1
Sambucus nigra (b)	.	3	2	.	.	+	+	.	.		.	.	2	.	.	.	+	.	.
Sambucus nigra (c)	.	.	.	.	.	.	.	.	.		.	.	+	.	.	.	.	.	.
Corylus avellana (b)	.	3	.	.	+	.	.	.	.		.	.	.	.	.	.	.	.	.
Galium aparine	+	2	1	.	.	3	1	.	+		+	.	.	.	.	.	1	+	+
Myosoton aquaticum	.	+	.	.	.	+	.	.	.		.	.	.	.	.	.	.	.	.
Myosotis sparsiflora	+	.	.	.	.	+	.	.	.		.	.	.	.	.	.	.	.	.
D.s. Com. Ulmus glabra-Salix alba (Salicion albae)																			
Ulmus glabra (a)	.	2	.	.	.	.	.	.	.		.	.	.	1	1	.	5	3	.
Ulmus glabra (b)	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.	1	4
Ulmus glabra (c)	.	.	.	.	.	.	.	.	.		.	.	.	.	.	+	.	.	.
Swida sanguinea (b)	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.	1	.	2
Swida sanguinea (c)	.	.	.	.	.	.	.	.	.		.	.	+	.	.	.	.	.	.
Viburnum opulus (b)	.	.	.	.	.	.	1	.	.		.	.	.	.	.	.	+	2	.
Rhamnus cathartica (b)	.	.	.	.	.	.	.	.	.		.	.	+	.	.	.	+	.	.
Elytrigia repens	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.	+	.	.
Carex hirta	.	.	.	.	.	.	.	.	.		.	.	.	1	1	.	.	2	+
Artemisia vurgaris	.	.	.	.	.	.	.	.	.		.	+	.	.	.	.	.	+	.
Arctium nemorosum	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.	.	+
Taraxacum officinale	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.	+	.	.
Cucubalis baccifer	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.	+	.	.
D.s. Ass. Salicetum albae & All. Salicion albae (Cl. Populetea albae)																			
Salix alba (a)	2	5	5	4	1	4	5	5	5		4	3	5	4	4	4	2	.	5
Salix fragilis (a)	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.	2	.
Populus nigra (a)	3	.	.	.	5	.	.	.	.		.	.	.	.	.	.	2	.	.
Populus alba (a)	.	.	.	.	.	1	.	.	.		.	.	.	.	.	.	.	.	.
Populus alba (b)	.	.	.	.	.	.	.	.	.		.	+	.	.	.	.	.	.	.
Populus alba (c)	.	.	.	.	.	.	.	+	.		.	.	.	.	.	+	.	.	+
Lisimachia nummularia	.	.	.	.	.	.	+	.	.		+	+	.	.	+	.	+	.	.
Scutellaria hastifolia	.	.	.	.	.	.	+	+	.		.	+	.	.	.	.	.	.	+
Myosoton aquaticum	.	.	.	.	+	.	.	.	.		.	.	.	.	.	.	.	.	.
Althaea officinalis	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.	+	.

Rarely occurred species: *Acer campestre* (b) (5 – 1), *A. platanoides* (c) (2, 9, 18 – +), *A. tataricum* (b) (5 – +, 7 – 1), *Alliaria petiolata* (1 – 2), *Alnus glutinosa* (a) (9, 10 – 1), *A. glutinosa* (c) (7 – +), *Alopecurus pratensis* (17 – +), *Anthriscus sylvestris* (4 – +), *Armeniaca vulgaris* (c) (16 – +), *Calamangrostis canescens* (12 – 3), *Carex acuta* (17 – +), *C. contigua* (14 – 1), *C. praecox* (16 – 1), *Carpinus betulus* (b) (5 – +), *Cirsium heterophyllum* (17 – +), *C. oleraceum* (12 – +), *C. palustre* (18 – +), *Chelidonium majus* (1 – +), *Chenopodium album* (11 – +), *Corydalis solida* (3 – +), *Daucus carota* (11 – +), *Dryopteris filix-max* (3 – +), *Epilobium roseum* (11 – +), *Euonymus europaea* (b) (6 – +), *E. europaea* (c) (5,6 – +), *Frangula alnus* (b) (7 – 1, 11 – +), *F. alnus* (c) (16 – +), *Fraxinus excelsior* (b) (10 –

+), *Gagea lutea* (3 – +), *Galium boreale* (16 – +), *Geranium robertianum* (18 – +), *Glechoma hirsuta (3 – 1), Grossularia reclinata* (b) (18- +), *Heracleum sibiricum (11 – +), Lactuca serriola (11 – 2), L. stricta* (12 – +), *L. tatarica* (12 – +), *Lapsana communis* (11 – +), *Lonicera tatarica* (b) (17 – +), *Lythrum virgatum* (16 – +), *Malus sylvestris* (a) (1 – 1), *Mentha longifolia* (14 – +), *Morus nigra* (c) (18 – 1), *Moehringia trinervia* (7 – +), *Omphalodes scorpioides (10 – +), Padus avium* (b) (9 – +), *Polygonatum multiflorum* (3 – +), *Polygonum amphibium* (7 – +), *Populus tremula* (a) (6,121 – 1), *P. tremula* (b) (11 – +), *P. tremula* (c) (18 – 1), *Prunus divaricata* (b) (17 – +), *Ptarmica carthilaginea* (13 – +), *Pyrus communis* (a) (1 – 3), *Quercus robur* (b) (16 – 1), *Ranunculus lingua* (15 – 1), *Rumex aquatica* (7 – +), *R. confertus* (13 – +), *Ribes nigrum* (b) (7 – 1), *Robinia pseudoacacia* (a) (1 – 1), *R. pseudoacacia* (b) (5 – +), *Rosa sp.* (c) (16 – +), *Salix caprea* (b) (16 – +), *S. cinerea* (b) (11 – 2), *Scilla siberica* (3 – +), *Senecio erucifolium* (11 – +), *Sonchus oleraceus* (12 – +), *S. palustris* (17 – +), *Stachys sylvatica (2 – 1), Stellaria neglecta (1 – 2), Tilia cordata* (b) (5 – 2), *Torylis japonica* (17 – +), *Typha latifolia* (17 – +), *Ulmus carpinifolia* (a) (3 – 2, 10 – 1), *U. carpinifolia* (b) (9 – +), *Viola hirta (1 – +), V. odorata* (5 – +).

Legends for descriptions

Description 1. O.Yu. Smagliuk 03.05.2014. In reduced beams on the floodplain of Sula river, near Lyaschivka (Chornobaivsky area Cherkasky district 29 block about 30 quarter).

Description 2. O.Yu. Smagliuk 25.05.2015. In poplar forest of river Chumgak valley, near Bilousivka (I Prokhorov-in Zolotoniyskiy forestry). At the foot of the slope of the indigenous banks plain area. The diameter 0,3-0,8 m, height 22 m.

Description 3. O.Yu. Smagliuk 29.04.2015. In osier bed in thalweg beams Lubenskyi Forestry AIC (tract Vynnytsia 23 quarter). The diameter 0.4 m, height 30 m.

Description 4. O.Yu. Smagliuk 03.05.2014. In the floodplain of Sula river near Mokhnach (Chernobaevsky area Cherkasy region).

Description 5. O.Yu. Smagliuk 23.05.2014. In the plantation of poplar and willow in broadleaf forests around Aleksandrovka (Lubny Poltava region, 35 quarter 2 division).

Description 6. N.O. Smoliar 25.05.2015. In willow riparian forests near river Chumgak around. Bilousivka. In description present green moss – 2% of coverage.

Descriptions 7, 10. N.O. Smoliar 30.04.3015. In willow forests of botanical nature monument "Mgarska dacha" (outskirts of Lubni).

Description 8. O.Yu. Smagliuk 26.05.2015. In a young osier bed floodplain of Chumgak river between villages Bilousivka and Kozorizi. The diameter 0,1-0,35 m, height – 16 m.

Description 9-10. O.Yu. Smagliuk 30.04.2015. In a large array willow forests of "Mgarska dacha". Water is squeezed. The diameter of 0.4 m, height – 26 m.

Description 11. N.O. Smoliar 26.07.2015. Trench among the fields to the right from the highway from Lypove to Kryva Ruda (Poltava region, Semyonov district).

Description 12. N.O. Smoliar 27.07.2015. Trench near the village. Demianivka (Poltava region, Semyonov district).

Descriptions 13, 14. O.Yu. Smagliuk 27.07.2015. On the island Vysokyi of Sula river. Implanted willows, diameter 0,2-0,4m, height 25 m.

Descriptions 15. O.Yu. Smagliuk 27.07.2015. On the island Horbivka of Sula river. Diameter 0,2-0,3 m, height 13 m.

Descriptions 16. N.O. Smoliar 26.07.2015. Trench on the north-east from village Demyanivka poplar diameter 0,2-0,3m, height – 18 m.

Description 17. O.Yu. Smagliuk 26.07.201. Trench on the north-east of Tukalo village (Poltava region, Semyonov district). 0.5 m elm diameter, willow – up to 1 m, height – 12 m.

Description 18. O.Yu. Smagliuk 26.07.2015. In the floodplain of Sula near the ferry of Tarasivka village (Poltava region, Orzhytsia destrict). Willow diameter 0.3 meters, height – 24 m.

The union **Salicion albae** includes more humid aggregations of the class which are represented by white willow forests of the floodplain of Sula and its right branches, wetland thalweg ravines on its left bank and, occasionally, branches of the left bank. They are clearly divided into three groups – mesophyllic, meso-hygrophyllic and hygrophyllic. They do not have much in common in terms of species content. We have marked them within the rank of provisor sub-associations of the **Salicetum albae** association. After some time, as the phytocenotic material of related areas will be accumulated, their syntaxonic status must be updated. It is also typical that these three sub-associations show complete similarity of species and ecotype conditions towards listed above syntaxons of alder forests – union **Alno-Ulmion** and associations of **Carici ripariae-Alnetum** and **Carici acutiformis-Alnetum.** Average density of wood tier estimates 0,65, shrub – 0,2, garss tier coverage – 75%. Willow forests in terms of floristic diversity are inferior to alber and poplar forests.

Sub-association of **S.a. aegopodietosum podagrariae** represents natural and cultivated white willow forestries mainly in moist thalwegs, sometimes on the higher creek's areas of Sula and Sula's tributaries that have a lot of mineral and organic compounds. Diameter of willow is in range of 0,1-0,8 m and height is 22-30 m. Scrubbery and herbaceous layers mostly consist of nemoralis (forest) species. Some of the sub-association's territories are used as pastures. Medium tree crown density is 0,7, medium density of scrubbery layer is 0,3, grass layer – 80%.

Sub-association of **S.a. urticetosum galeopsifoliae** represents meso hygrophyllic natural white willow forests in moist thalweg, in particular on the territory of botanical nature monument "Mgarska dacha" (outskirts of Lubny), the lower parts of the floodplain Sula and its tributaries (mostly river Chumgak), on rich mineral and organic nutrients, somewhat nitrified soils. In summer water lies on the depth of 0,2-0,3 m or almost near the ground surface; in spring and after rains flowing water is above the ground level. Diameter of willow rages from 0,1-0,7 m, height – 16-27 м. Scrubbery and herbaceous layers include typical species of swampy alder forests, excluding typical species of **Salicion albae union.** In the aggregations of sub-associations of "Mgarska dacha" was found a very rare species for Forest-Steppe – *Urtica kioviensis.* Average density of wood tier estimates 0,7, scrubbery – 0,2, grass tier coverage – 80%. Floristic index is high for the willow forests of the region.

Sub-association of **S.a. caricetosum acutiformis** represents hygrophyllic, periodically flooded but mostly drained natural and planted white willow forests on the floodplains of lower Sula area islands and in the fields on the left bank, and also in the lower basin of Sula. Diameter of willow ranges from 0,2-0,4 m, height – 13-25 m. Among shrub and grass tiers, typical species of **Salicion albae** union are dominant. Average density of wood tier estimates 0,5, shrub – 0,15, grass tier coverage – 70%, it means that density of all levels

is the lowest for willow forests. In terms of floristic content it is inferior to other groups of willow forests.

Aggregation **Ulmus glabra-Salix alba (Salicion albae)** represent mild transformed white willow-elm groves among the fields in the outskirts of Demianivka, Tukalo, Obolon, Semenov district of Poltava region, occasionally flooded willow forests near Tarasovka village of Orzhyts region. Diameter of elm ranges from 0,5 m, willor 0,2-1 m, height 12-24 m. Average density of wood and shrub tier is the highest for willow groups and estimates: wood (0,8), shrub – (0,4), grass tier coverage – 40% – the lowest index. The floristic content of the aggregation is the highest among willow forests. Syntaxonic position of the aggregation requires detalization and according to floristic content it is related to the union **Calamagrostio epigei-Populion nigrae**.

Twenty yers ago the communities of mesophillic union **Rubo caesii-Amorphion fruticosae** were described for Kaniv Natural Preserve [14] and xeromesophyllic union **Galio veri-Aristolochion clematidis** from flooded island of Forest-Steppe region of Dnieper [14]. Comparsion of these syntaxons with the aggregations of flooded areas of Steppe region have shown that there is only one allocated union [3, 7, 11]. It may be determined as the driest (mesoxerophyllic, xeromesophyllic and alsp mesophyllic) flooded poplar forests of the Forest-Steppe and Steppe areas on sand and sandy soils. Therefore, new name of the union was chosen in monograph about forest plants classification of the Northern Black Sea region [10], which is very informative and reflects the environmental and geographical specificity of the unity.

In wood tier of flooded poplar forests of **Calamagrostio epigei-Populion nigrae** union, *Populus nigra* L. Is a typical dominant, in the cover – *Rubus caesius* L., *Carex praecox* Schreb., *Calamagrostis epigeios* (L.) Roth., *Glechoma hederacea* L., *Elytrigia repens* (L.) Nevski. Description of the union from lower Sula basin is summarized in table 3. Overall, the aggregation of poplar forests are richer than alder and willow forests. The highest amount of trees (as seedlings) and shrubs species comparing to the entire region was indicated in the aggregations within unity.

***Table* 3. Phytocenotic characteristic of poplar forests of lower Sula basin**

Desnity of wood tier	06	08	04	03	07	04	07	07	07	10	09	07	08	08	06	07	04
Density of shrub tier	01	02	04	+	01	01	04	06	07	02	01	02	02	03	03	08	06
Projective cover of grass tier	75	30	80	3	25	3	45	20	25	1	85	55	15	65	75	60	60
Amount of species described	22	24	17	12	15	14	14	17	38	10	20	35	24	20	19	37	26
Number of description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
D.s. Ass. Galio veri-Populetum nigrae nom. Nov																	
Populus nigra (a)	5	5	2	2	5	4	3	4	3	.	.	.	.	.	.	.	.
Populus nigra (b)	.	+	.	+	2	2	.	1	+	.	.	.	.	.	.	.	.
Populus nigra (c)	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Salix alba (a)	.	.	3	2	.	.	.	.	1	.	.	.	.	.	.	.	.
Salix alba (b)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Galium verum	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
D.s. Ass. Strophiostomo sparsiflorae-Populetum albae nom. nov.																	
Amorpha fruticosa(b)	.	.	.	.	.	.	4	4	3	.	.	.	.	.	.	.	.
Amorpha fruticosa (c)	.	.	.	.	.	.	1	1	+	.	.	.	.	+	.	.	.
Achillea millefolium	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.
Populus alba (a)	.	.	1	.	.	.	4	3	2	4	5	.	.	.	.	.	.
Populus alba (b)	.	.	.	.	.	.	+	1	+	+	.	+	.	.	.	+	.
Populus alba (c)	.	.	.	.	.	.	.	.	+	+	+	.	.	+	.	.	.
Humulus lupulus	.	.	.	.	.	.	.	.	2	+	3	.	.	.	+	.	+
D.s. Com. Swida sanguinea-Populus x canescens																	
Populus x *canescens* (a)	.	.	.	.	.	.	.	.	.	.	.	5	5	5	5	5	.
Populus x *canescens* (b)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Populus x *canescens* (c)	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.
Swida sanguinea (b)	.	+	.	.	.	.	.	.	.	+	.	+	2	2	2	1	.
Swida sanguinea (c)	+	+	.	.	.	.	.	.	+	.	.	+	+	+	.	.	+
Viburnum opulus (b)	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.
Rosa sp. (c)	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.
Populus tremula (c)	.	.	.	.	.	+	.	.	+	.	+	+	.	.	.	1	.
Quercus robur (c)	.	.	.	.	.	.	.	+	.	.	.	.	+	+	.	+	.
Lysimachia vulgaris	.	.	.	.	.	+	.	.	.	.	.	+	+	.	.	+	.
Galium aparine	.	1	+	.	+	.	.	.	.	.	.	.	.	.	+	+	.
Geum urbanum	.	.	.	.	.	.	.	.	2	+	.	.	+	+	.	+	.
Moehringia trinervia	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	.
Taraxacum officinale	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.
Artemisia vurgaris	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	+	.
Cucubalis baccifer	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.
Equisetum arvense	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	1
Galium boreale	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.
Phragmites australis	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.
Carex otrubae	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Arctium nemorosum	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.
D.s. Com. Carex hirta-Populus balsaminus																	
Populus balsaminus (a)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Populus balsaminus (c)	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+

Ending tabl. 3

Desnity of wood tier	06	08	04	03	07	04	07	07	07	10	09	07	08	08	06	07	04
Density of shrub tier	01	02	04	+	01	01	04	06	07	02	01	02	02	03	03	08	06
Projective cover of grass tier	75	30	80	3	25	3	45	20	25	1	85	55	15	65	75	60	60
Amount of species described	22	24	17	12	15	14	14	17	38	10	20	35	24	20	19	37	26
Number of description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
D.s. All. Calamagrostio epigei-Populion nigrae																	
Rubus caesius	.	.	5	.	.	.	.	.	.	+	1	.	1	.	.	5	1
Elytrigia repens	3	.	.	.	1	+	.	+	.	.	4	3	.	2	.	.	+
Poa pratensis	3	.	.	.	+	.	.	.	.	.	3	2	.	.	.	+	2
Agrostis stolonifera	.	.	.	.	.	.	1	2	.	.	2	.	.	1	.	+	.
Dactylis glomerata	.	+	.	.	.	.	.	.	2	.	.	.	.	2	.	+	.
Calamangrostis epigeios	5	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.
Carex hirta	.	.	.	+	3	.	4	2	3	.	3	.	2	.	.	+	5
Carex praecox	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+
Lactuca serriola	.	.	.	+	+	.	+	.	.	.	+	.	.	+	.	.	+
Glechoma hederacea	.	1	+	.	+	.	.	+	.	.	1	2	.	.	+	+	+
Anthriscus sylvestris	.	+	.	.	+	.	.	.	+	.	.	1	.	+	.	1	.
Fallopia convolvulus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Lactuca tatarica	+	.	.	.	.	.	.	.	2	.	.	.	+	.	.	.	.
Aristolochia clematitis	.	.	+	.	.	.	.	.	1	.	.	.	.	.	.	.	.
Sonchus arvensis	.	.	.	.	.	.	+	+	.	.	.	+	.	.	.	.	.
Alopecurus pratensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
D.s. Cl. Populetea albae																	
Salix fragilis (a)	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
Acer negundo (a)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Acer negundo (b)	.	+	4	.	.	.	+	+	1	1	.	.	+	.	.	4	+
Acer negundo (c)	+	+	.	.	+	.	.	.	+	.	.	+	+	.	.	+	.
Urtica dioica	.	1	+	.	+	.	.	.	1	.	2	.	+	1	.	+	.
Lysimachia nummularia	.	.	.	+	.	+	.	.	.	+	+	.	.	.	.	+	+
Symphytum officinale	.	.	+	.	.	.	+	+	.	.	.	.	.	.	.	+	.
Carex acutiformis	.	2	+	.	.	.	.	.	.	.	.	4	1	.	.	.	.
Lythrum salicaria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
Ranunculus repens	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Mentha arvensis	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	+
Myosoton aquaticum	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Scutellaria hastifolia	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+
Stachys palustris	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lycopus europaeus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Solanum dulcamara	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Calystegia sepium	.	+	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.
Myosoton aquaticum	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+
Ptarmica carthilaginea	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Potentilla reptans	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Thalictrum flavum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Asparagus officimalis	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Sonchus palustris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Althaea officinalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Eupatorium cannabinum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cirsium palustre	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Rarely occurred species: *Acer campestre (a) (15 – 1), A. campestre (b) (15 – 1), A. campestre (c) (15 – +), A. platanoides (b) (2 – 3, 13 – +), A. platanoides (c) (12 – +), A. tataricum (c) (2, 15 – +), Achillea inundata (1 – 1), Alliaria petiolata (12 -1, 15 – +), Armeniaca vulgaris (b) (9 – +), Artemisia absinthium (5 – +), Atriplex lucens (17 – +), Ballota nigra (14 – 3), Brachypodium sylvaticum (9 -1), Calamangrostis canescens (14 – 1), Campanula rotundifolia (1 – +), Carduus crispus (11 – +), Carex acuta (3 – +), C. caespitosa (6 – +), C. contigua (12 – +), C. melanostachya (4, 6 – +), C. vulpina (6 – +), Chaiturus marrubiastrum (3 – +), Chamaecytisus ruthenicus (7 – +), Chelidonium majus (2, 12 – 3, 8 – +), Clinopodium vulgare (12 – +), Convallaria majalis (15 – 5), Corylus avellana (c) (15 – +), Crataegus sp. (b) (2, 12, 16 – +), C. sp. (c) (1, 2,12 – +), Cynoglossum officinale (5 – +), Daucus carota (11 – +), Dryopteris carthusiana (10 – +), Eleagnus argentea (b) (13, 14 – +), Conyza canadensis (17 – +), Euonymus europaea (b) (15 -1), E. europaea (c) (2, 15 – +), Fragaria moschata (9 – 3), Frangula alnus (b) (9 – +, 13, 16 – 1), F. alnus (c) (2 – +), Fraxinus excelsior (b) (2- +), F. excelsior (c) (2, 15 – +), F. viridis (a) (4 -1), F. viridis (b) (3, 4 – +), F. viridis (c) (6 – +), Galium palustre (15 – +), Geranium robertianum (2 – 2, 12 – 3), Heracleum sibiricum (14 – +), Hieracium umbellatum (9 – +), Hypericum perforatum (1, 16 – +), Iris pseudacorus (15 – +), Ligustrum vulgare (b) (9 – +), Linaria vulgaris (1 – +), Lythrum salicaria (6 – +), Malus praecox (b) (7 – +), Melandrium album (5, 11- +), Morus nigra (b) (1, 2, 4 – +, 9 – 2), M. nigra (c) (1, 2 – +), Padus racemosa (b) (1, 12 – +), Parthenocissus quinquefolius (8 – +), Pinus sylvestris (a) (9 -1), P. sylvestris (b) (7 – +), Poa nemoralis (6 – +), Populus tremula (b) (6, 9, 11 – +), Prunus divaricata (c) (16 – +), P. spinosa (b) (9, 17 – +), Pyrola rotundifolia (9 – 2), Pyrus communis (b) (1,2 – +), Quercus robur (b) (1, 4, 13 – +), Rhamnus cathartica (b) (1 – 2), R. cathartica (c) (1, 9, 12 – +), Ribes nigrum (b) (15 – 2), R. nigrum (c) (16 – +), Robinia pseudoacacia (b) (1, 9, 12 – +), Rumex confertus (12 -+), Salix cinerea (b) (9 – 2, 13 – +), Sambucus nigra (b) (1, 2, 9 – +, 11 – 2, 13,14 – 1), Sambucus nigra (c) (1, 2, 9, 11, 13, 16 – +), S. racemosa (c) (12 – +), Setaria viridis (17 – +), Sorbus aucuparia (c) (12, 13 – +), Stellaria media (1 – +), Steris viscaria (9 – 1), Torylis japonica (16 – +), Trifolium alpesre (17 – +), Trifolium medium (17 -+), Tussilago farfara (9 – +), Ulmus carpinifolia (b) (9 – +), U. glabra (a) (10 – 5), U. glabra (b) (12, 16 – +), U. glabra (c)*

(12 – +), Ulmus laevis (a) (15 – 1), U. laevis (b) (3, 10 – +), U. laevis (c) (15 – +), Veronica longifolia (17 – +), Viburnum lantana (b) (9 – +), V. opulus (c) (7 – +), Vicia cracca (5, 17 – +), Viola canina (16 – +), Viola elatior (6 – +).

Legends for descriptions

Description 1. N.O. Smoliar 27.07.2015. In the tract "Horbivka" on Romanov Horb Island in the gulf of Sula.

Description 2. N.O. Smoliar 27.07.2015. In the tract "Dubina" on the island Lyaschivka in Sula lough. Implanted poplars in the peripheral zone of the island.

Description 3. O.Yu.Smagliuk 24.07.2014. Areas of floodplain of Sula river near the bridge across Sula.

Description 4-6. O.Yu.Smagliuk 23.05.2014. Poplar plantations on the southern part of village. Nesen-Irzhavets (Poltava region, Orzhytsia district).

Description 7-10. O.Yu. Smagliuk 26.07.2015. Forest area of the floodplain near Sula upland terraces near Lypove village. The diameter of poplar 0,3-0,4 m, height – 23 m.

Description 11. N.O. Smoliar 27.07.2015. Trench in the center of the field, right to the highway from Kryva Ruda to Lypove.

Description 12. N.O. Smoliar 27.07.2015. On the island Vysokiy in the gulf of Sula.

Description 13. N.O. Smoliar 26.07.2015. Trench system on the fields near Demyanivka village.

Description 14. N.O. Smoliar 26.07.2015. Trench in the center of the field near Kryva Ruda village (Poltava region, Semyonov district).

Description 15. N.O. Smoliar 30.04.3015. On the territory of "Mgarska dacha" near the city Lubny.

Description 16. O.Yu.Smagliuk 26.07.2015. Trench in the outskirts of Kukoba village (Poltava region, Semyonov district).

Description 17. N.O. Smoliar 26.07.2015. Trench system in the center of the field in the outskirts of Demyanivka vallage.

Association **Galio veri-Populetum nigrae** nom. nov. prov.

Diagnostic species: *Populus nigra* (dom.), *Salix alba* (dom.), *Calamangrostis epigeios, Carex praecox, Galium verum.*

The majority of poplar forests of the lower Sula basin are close to association, described as a variant of **Populus nigra** (nomenclature type of this association belongs to this variant) association **Galio veri-Aristolochietum clematidis** Shevchyk et V.Sl. 1996 [14]. But this name contradicts to the International Code of Phytosociological Nomenclature [17], because it does not contain any type of dominant tier (trees) in its name, so it must be changed. So, we propose the new name – **Galio veri-Populetum nigrae.**

Aggregations of association in the territory of experimental region are natural aggragations of black poplar, black poplar's croppers aging up to 50 years and spontaneous forests in the former agricultural lands. They are detected on the Sula's flood plains, frequently on the islands of Sula's creeks, sometimes in the form of small forestries among the fields on Sula's left shore. These are the driest aggregations on the experimental territory. Even though humidity varies according to season, floods in the experimental region are rare. Diameter of black poplar is in range of 0,1-0,5 m and height is 6-28 m. Medium density of tree crowns is lowest among poplars' aggragations (0,55) and scrubbery (0,1), covering of grass layer is considerable – 0.55. These aggregations are the poorest in floristical contingent among poplars' aggragetions.

Association **Strophiostomo sparsiflorae-Populetum albae** nom. nov. prov.

Diagnostic species: *Populus alba* (dom.), *P. nigra* (dom.), *Amorpha fruticosa, Humulus lupulus.*

Most of white poplar forests of the lower Sula basin are close to association, described as **Strophiostomo sparsiflorae-Amorphetum** Shevchyk et V.Sl. 1996 [14]. But this name contradicts to the International Code of Phytosociological Nomenclature [17], because it does not contain any type of dominant tier (trees) in its name, so it must be changed. What we offer here is previously called **Strophiostomo sparsiflorae-Populetum albae.** Association represents flooded and trench poplar forests of the valley of Sula river. Diameter of poplars ranges between 0,3-0,5 m, height – 23-27 m. Average density of wood tier estimates 0,8, shrub – 0,4, grass tier coverage – 35%.

Aggregations of **Swida sanguinea-Populus x canescens (Calamagrostio epigei-Populion nigrae)** diagnosed in trenches throughout the fields. They have been formed by hybrid species (*Populus alba* x *P. tremula*) and noticed in the outskirts of villages Kryva Ruda, Demyanivka, Kukoba, Semenov district of Poltava region. Also, indicated on the territory of botanical natural monument "Mgarska dacha" near Lubny and on the Vysoky island in Sula lough. Diameter of the poplar ranges from 0,07-0,4 m, height – 15-18 m. Syntaxonomical position of the aggregation requires more researches, probably it should be refereed to recently described class **Dactylido glomeratae-Populetea tremulae** Vorobyov et I. Solomakha in I.Solomakha et al. 2015 [10]. Average density of wood tier is 0,8, shrub – 0,35, grass tier coverage – 45%. In terms of floristic content these communities are the richest among poplar forests.

Aggregations of **Carex hirta-Populus balsaminus (Calamagrostio epigei-Populion nigrae)** was found in one of the trenches in the fields, left from the highway from Lypove to Gradyzk near Demyanivka villagte, Semenov district of Poltava region. Density of wood tier is low – 0,4, shrub and seedings – 0,6, grass tier coverage – 60%.

Conclusion. Flooded alder (*Alnus glutinosa*), willow (*Salix alba,* зрідка *S. fragilis*) and poplar (*Populus nigra, P. alba, Populus* x *canescens*) forests in the basin of lower Sula occupy a lot of space and characterized by significant level of cenotic diversity. In particular, meso-hygrophyllic black alder forests have been assigned to the **Alno-Ulmion** union of the **Querco-Fagetea** class, which is divided into two groups. Swampy black poplar forests, which are distributed mainly on the floodplains of small rivers, have been assigned to **Alnetea glutinosae** class, within which two associations were identified. One of them – is the most common among alder forests of the region association **Carici ripariae-Alnetum glutinosae** – three variants were selected. Flooded forests with the domination of *Salicaceae* family species have been assigned to **Populetea albae** and order **Populetalia albae**. Willow forests of the floodplains of river Sula and its branches, and also moist thalweg ravines and, occasionally, trenches, belong to the union **Salicion albae** and association **Salicetum albae**. Within the association, three widespread but very different sub-associations have been previously allocated (its rank must be obviously increased), homologous to syntaxons of alder forests and one community of unidentified status. Poplar forests of Sula lower course floodplains including those which are situated on the islands of the Sula lough, occupy less area comparing to alder and willow forests, most part of them was implanted. They belong to the union **Calamagrostio epigei-Populion nigrae**, and, according to the dominant tree layer is divided into two associations, which name we offer to change according to the International Code of Phytosociological Nomenclature [17] – **Galio veri-Populetum nigrae** and **Strophiostomo sparsiflorae-Populetum albae** (two options selected). Trench aggregations of the left bench of Sula lower course **Swida sanguinea-Populus x canescens** turned out to be

very interesting, but, for now, they are described as non-ranked. Its syntaxonomical status must be specified. Community of **Carex hirta-Populus balsaminus** was found only in one locality. It should be noted that species from the Red Book were not found in alder, willow and poplar forests of the lower basin of Sula river, however a number of regionally rare species were revealed and a separate publication will be dedicated to this theme.

Considering the risks of damages and adventisation of the flora, the least transformed, the largest and the oldest poplar, alder and willow forests of each association require preservation. Significant water preservation role is the indisputable argument for prohibition of its total deforestation.

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В. Соломаха, д-р біол. наук, Н.Смоляр, канд. біол. наук, О. Смаглюк, асп.
Київський національний університет імені Тараса Шевченка, Київ, Україна

ФЛОРИСТИЧНА КЛАСИФІКАЦІЯ ЗАПЛАВНИХ ВІЛЬХОВИХ, ВЕРБОВИХ І ТОПОЛЕВИХ ЛІСІВ У БАСЕЙНІ НИЖНЬОЇ СУЛИ (УКРАЇНА)

Досліджено заплавні вільхові (Alnus glutinosa), вербові (Salix alba, зрідка S. fragilis) та тополеві (Populus nigra, P. alba, колки з Populus x canescens) ліси у басейні нижньої Сули. Мезогігрофільні чорновільхові ліси віднесено до союзу Alno-Ulmion класу Querco-Fagetea (com. Aegopodium podagraria-Alnus glutinosa, D.c. Acer negundo-Alnus glutinosa). Заболочені чорновільхові ліси класу Alnetea поширені переважно на заплавах малих річок і представлені двома асоціаціями (Carici ripariae-Alnetum glutinosae та Carici acutiformis-Alnetum glutinosae). Заплавні вербові та тополеві ліси віднесено до класу Populetea albae (порядок Populetalia albae). Вербові ліси заплав Сули та її приток, а також перезволожених тальвегів балок та зрідка колків належать до союзу Salicion albae і асоціації Salicetum albae. Тополеві ліси пониззя заплави Сули належать до союзу Calamagrostio epigei-Populion nigrae і розділяються на дві асоціації, назву яких пропонуємо змінити згідно з вимогами Міжнародного кодексу фітосоціологічної номенклатури – Galio veri-Populetum nigrae та Strophiostomo sparsifloraе-Populetum albae. Наголошується на відсутності в досліджених угрупованнях видів із Червоної книги України. Найменш трансформовані, найбільші за площею та найстаріші вільхові, вербові та тополеві ліси кожної з асоціацій потребують заповідання, на користь чого свідчить також їх значна водоохоронна роль.

Ключові слова: Querco-Fagetea (Alno-Ulmion), Alnetea, Populetea albae, Україна, Лівобережний Лісостеп, басейн нижньої Сули, синтаксономія.

В. Соломаха, д-р биол. наук, Н.Смоляр, канд. биол. наук, Е. Смаглюк, асп.
Киевский национальный университет имени Тараса Шевченко, Киев, Украина

ФЛОРИСТИЧЕСКАЯ КЛАССИФИКАЦИЯ ПОЙМЕННЫХ ОЛЬХОВЫХ, ИВОВЫХ И ТОПОЛЕВЫХ ЛЕСОВ В БАССЕЙНЕ НИЖНЕЙ СУЛЫ (УКРАИНА)

Исследованы пойменные ольховые (Alnus glutinosa), ивовые (Salix alba, зрідка S. fragilis) и тополевые (Populus nigra, P. alba, колки с Populus x canescens) леса в бассейне нижней Сулы. Мезогигрофильные ольховые леса отнесены к союзуAlno-Ulmion классу Querco-Fagetea (com. Aegopodium podagraria-Alnus glutinosa, D.c. Acer negundo-Alnus glutinosa). Заболоченные ольховые леса класса Alnetea glutinosae распространены преимущественно в поймах малых рек и представлены двумя ассоциациями (Carici ripariae-Alnetum glutinosae и Carici acutiformis-Alnetum glutinosae). Пойменные ивовые и тополевые леса отнесены к классу Populetea albae (порядок Populetalia albae). Ивовые леса пойм Сулы и ее притоков, а также переувлажненных тальвегов балок и изредка колков принадлежат к союзу Salicion albae

и асоциации Salicetum albae. Тополевые леса низовий поймы Сулы отнесены к союзу Calamagrostio epigei-Populion nigrae и распределяются на две ассоциации, название которых предлагаем изменить согласно требований Международного кодекса фитосоциологической номенклатуры – на Galio veri-Populetum nigrae и Strophiostomo sparsiflorae-Populetum albae. Указывается на отсутствие в исследуемых сообществах видов растений из Красной книги Украины. Наименее трансформированные, наибольшие по площади и более старые ольховые, ивовые и тополевые леса каждой из ассоциаций требуют заповедания, в пользу чего свидетельствует их значительная водоохранная роль.

Ключевые слова: Querco-Fagetea (Alno-Ulmion), Alnetea glutinosae, Populetea albae, Украина, Левобережная Лесостепь, бассейн нижней Сулы, синтаксономия.

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O. Smutko, PhD stud
Taras Shevchenko National University of Kyiv, Kyiv, Ukraine,
L. Radchenko, JS, A. Mironenko, MD.
SI "Gromashevsky L.V. Institute of epidemiology and infectious diseases, NAMS of Ukraine", Kyiv, Ukraine

MOLECULAR AND GENETIC CHARACTERISTICS OF SURFACE AND NONSTRUCTURE PROTEINS OF PANDEMIC INFLUENZA VIRUSES A(H1N1)PDM09 IN 2015-2016 EPIDEMIC SEASON

The aim of the present study was identifying of molecular and genetic changes in hemaglutinin (HA), neuraminidase (NA) and non-structure protein (NS1) genes of pandemic influenza A(H1N1)pdm09 strains, that circulated in Ukraine during 2015-2016 epidemic season. Samples (nasopharyngeal swabs from patients) were analyzed using real-time polymerase chain reaction (RT-PCR). Phylogenetic trees were constructed using MEGA 7 software. 3D structures were constructed in Chimera 1.11.2rc software.Viruses were collected in 2015-2016 season fell into genetic group 6B and in two emerging subgroups, 6B.1 and 6B.2 by gene of HA and NA. Subgroups 6B.1 and 6B.2 are defined by the following amino acid substitutions. In the NS1 protein were identified new amino acid substitutions D2E, N48S, and E125D in 2015-2016 epidemic season. Specific changes were observed in HA protein antigenic sites, but viruses saved similarity to vaccine strain. NS1 protein acquired substitution associated with increased virulence of the influenza virus.

Key words: A(H1N1)pdm09 influenza virus, amino acid substitution, antigenic site, non-structure protein.

Introduction. Influenza viruses are antigenicaly variable pathogens, capable of continuously evading immune response. Accumulation of mutations in the antigenic sites is called the "antigenic drift". In circulating influenza viruses this antigenic drift is a major process, accumulating mutations at the antibody binding sites of receptor proteins, and enabling the virus to evade recognition by hosts' antibodies, which often translates into periodic epidemics of influenza. To tame the influenza spread a flexible vaccination WHO's program, based on periodic production of novel versions of vaccine, is adapted to the actually prevalent stain(s). For such programs the data on phylogenesis of circulating versions of pathogens, and genetic stability of their hemagglutinin (HA) sets data, could help to rationalize possible epidemiological measures [1].

This year's seasonal influenza risk assessment identifies type A viruses, in particular A(H1N1)pdm09, as dominant thus far in EU/EEA countries. There are strong indications from some EU/EEA countries that the A(H1N1)pdm09 virus is responsible for the hospitalization of a large number of severe cases. This includes hospitalizations for severe outcomes for both risk groups and otherwise healthy young adults. A similar pattern of severity is likely to be observed in other countries as the season progresses [2].

Matherials and methods. Samples were analyzed using real-time polymerase chain reaction (RT-PCR). Influenza viruses subtype A(H1N1)pdm09 were isolated in MDCK and MDCK-SIAT cell culture from samples positive in PCR. Hemagglutinin (HA), neuraminidase (NA) and non-structure protein (NS1) gene sequences of Ukrainian isolates were selected to perform phylogenetic comparisons. Phylogenetic analysis was performed using MEGA 7 software [3]. The influenza A(H1N1)pdm09 sequences are characterized in a neighbor-joining phylogenetic tree with reference strains rooted from the current vaccine strain, A/California/07/2009-like virus. 3D structures were constructed in Chimera 1.11.2rc software [4].

Results and discussion. In this study we compared nucleotide sequences of influenza viruses HA, NA and NS1 proteins.

Comparison of neuraminidase (HA) genes.

Over the last five years the HA genes have evolved and eight genetic groups have been designated, with A/California/7/2009 representing group 1, and viruses in group 6 have formed clusters designated groups 6A, 6B and 6C. Viruses collected in 2015-2016 season fell into genetic group 6B and in two emerging subgroups, 6B.1 and 6B.2. Subgroup 6B and subgroups 6B.1 and 6B.2 are defined by the following amino acid substitutions in HA1 and HA2.

Most of the viruses had amino acid substitutions that define the new group of viruses in genetic group 6B, now called group 6B.1. Isolates had a substitution at one of these sites N162K resulting in loss of glycosylation site, acquired by the 6B.1 viruses (fig.1).

Also Ukrainian viruses had substitutions S84N and I216T. Three isolates from Khmelnitsky, Kiev and Ternopol had unique mutation in HA2 – I91V. New substitution S83P was observed in the majority of viruses from 6B.1 group. Four isolates from Odessa belonged to group 6B.2. Its HA protein had a substitution at residue 152 of HA1, V152T. Substitutions in this region, as well as at residue 152, are often selected in culture and known to affect the antigenicity of the virus. Viruses from group 6B.2 also had substitutions R113K D127E (gain of glycosylation site) and E47Q (HA2).

Gain or loss of *N*-linked glycosylation sites has been shown to alter HA protein surface topology. A gain in glycosylation could be advantageous to the virus by virtue of a masking effect on important antibody recognition sites, thus potentially modulating viral antigenicity [5]. Observations are based solely on sequence motifs. For the influenza A(H1N1)pdm09 specimens characterized in this report, two mutations, S162N (serine to asparagine) and D127E (asparagine acid to glycine acid), were observed that could cause a gain of a glycosylation motif.