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РЕЗУЛЬТАТЫ ИЗУЧЕНИЯ СОРНО-ПОЛЕВОЙ ФЛОРЫ ПРИМОРСКОГО КРАЯ В 2016–2020 гг.

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Представлены результаты изучения сорного компонента агроценозов сои, ранних зерновых культур и кукурузы в Приморском крае. Всего в 2016–2020 гг. обнаружено 111 видов сорных растений, относящихся к 35 семействам. По сравнению с результатами обследований посевов сельскохозяйственных культур, проведенных в 2006–2015 гг., общее количество выявленных видов увеличилось на 23. Наибольшее количество видов принадлежит семействам Asteraceae (24), Poaceae (15), Polygonaceae (11), Fabaceae (9), Brassicaceae (8), Caryophyllaceae (7) и Lamiaceae (5). Остальные 26 семейств представлены 1–3 видами каждое. Впервые обнаружены сорняки-представители семейств Scrophulariaceae, Violaceae, Lythraceae, Onagraceae, Asclepiadaceae и Boraginaceae. Наибольшим оказался флористический состав соевых агроценозов – 108 сорных видов 31 семейства. В посевах зерновых культур и кукурузы разнообразие сорняков отмечено менее значительным – 75 видов 22 семейств и 72 вида 25 семейств соответственно. Сорная растительность во всех указанных культурах представлена 62 видами 19 семейств. Основными сорными видами, которые произрастали на 97–99% обследуемой территории при достаточно высокой средней густоте стояния (21–61 шт./м^2), оказались амброзия полынолистная, ежовник обыкновенный (просо куриное) и амброзия полыннолистная. Также более чем на половине обследованных посевов сои, зерновых культур и кукурузы присутствовали шерстняк мохнатый, осот полевой, пырей ползучий, марь белая, виды полыни, хвощ полевой, бодяк щетинистый, коммелина обыкновенная и щетинник малорослый. Практические мероприятия по защите от сорных растений в Приморском крае должны быть в первую очередь нацелены на контролирование этих видов.

Ключевые слова: сельскохозяйственная культура, обследование посевов, засоренность, сорное растение, вид, видовой состав, встречаемость, плотность засорения

RESULTS OF THE STUDY OF THE WEED-FIELD FLORA OF PRIMORSKY TERRITORY IN 2016-2020

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The results of the study of the weed component of soybean, early grain crops and maize agrocenoses in Primorsky Territory are presented. In total, 111 species of weeds belonging to 35 families were found during the period from 2016 to 2020. Compared with the results of crop surveys conducted in 2006-2015, the total number of species detected has increased by 23. The largest number of species belongs to the families Asteraceae (24), Poaceae (15), Polygonaceae (11), Fabaceae (9), Brassicaceae (8), Caryophyllaceae (7) and Lamiaceae (5). The remaining 26 families were represented by 1-3 species each. For the first time weeds-representatives of the families Scrophulariaceae, Violaceae, Lythraceae, Onagraceae, Asclepiadaceae and Boraginaceae have been discovered. The floristic composition of soybean agrocenoses was the highest with 108 weed species from 31 families. In cereal and maize crops, weed diversity was less significant, with 75 species in 22 families

and 72 species in 25 families, respectively. Weed vegetation in all the above crops is represented by 62 species of 19 families. The main weed species that grew on 97-99% of the surveyed territory with a sufficiently high average density of standing (21-61pcs/m^2) were Asian copperleaf, cockspur grass and common ragweed. Also, more than half of the surveyed crops of soybeans, cereals and corn were hairy cupgrass, perennial sow thistle, common couch-grass, common lamb's quarters, wormwood species, field horsetail, yellow thistle, dayflower and yellow foxtail. Practical measures to protect against weeds on the Primorsky Territory should be primarily aimed at controlling these species.

Keywords: agricultural crop, crops inspection, weed contamination, weed plant, species, species composition, occurrence, density of contamination

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INTRODUCTION

The Far Eastern Federal District (FEFD) covers 36% of the area of the Russian Federation. The southern territories of the FEFD include the Amur Region, the Jewish Autonomous Oblast, the Khabarovsk Territory and the Primorsky Territory, where 77% of the Far Eastern agricultural land and 92% of the arable land are located [1]. In the Primorsky Territory over the last 5 years the sown area has increased by 26.6 thousand hectares and reached 449.2 thousand hectares in 2020. In 2020, almost 62% of the Territory is sown with soybeans, 7.6% with spring cereals and 15.7% with corn[1].

The pace of development of agricultural production in Primorye still does not meet the growing needs for food and raw materials. A serious obstacle in obtaining high and stable yields of cultivated crops is a significant weed infestation of the fields, determined by the peculiarities of the local monsoon climate.

The main harm caused by weeds is a sharp decrease in the crop yield and deterioration of the quality of products as a result of interspecific competition for the main factors of life - water, light and nutrients [2]. For example, according to the data of the All-Russian Institute of Oil Crops, removal of nutrients by ragweed above ground mass (20 pcs. /m^2, or 5 t/ha) amounts to: nitrogen - 135 kg/ha, phosphorus - 40 kg/ha, potassium - 157 kg/ha [3]. In Russia, the potential risks of reducing the yield of grain crops from weeds annually average 15.5%, soybeans - 16.5%. In 2017-2019, yield losses from the spread of weeds in agroecosystems averaged 16.1% in the country [4].

Scientific and informational basis for the development and implementation of practical measures to protect plants are the results of phytosanitary monitoring in combination with diagnosis and prediction of development and spread of pests in agrocenoses. Monitoring studies provide the agricultural sector with relevant phytosanitary information, including data on the weed infestation of crops [5, 6].

The species composition of weeds, their number and distribution in agrocenoses are in constant dynamics determined by climatic changes, and directly depend on seasonal weather conditions and a number of anthropogenic factors. On the territory of the agroecosystem or crop rotation there are many weed spe-

[1]Sown areas of agricultural crops in the Primorsky Territory: Statistical collection. Primorskstat. Vladivostok, 2021. 99 p.

cies, which under the influence of the features of cultivation technologies manifest themselves differently in different crops, consistently cultivated on the same field contour. Thus, the weed infestation of crops is determined by a number of factors, among which the main ones are the features of cultivation technology and soil and climatic conditions [7].

At present, herbological studies in Russia are carried out on a regular basis mainly in the Moscow, Leningrad, Novgorod, Pskov, Chelyabinsk oblasts, Krasnodar, and Primorsky territories. We study the succession of weeds in agrophytocenoses of the most important agricultural crops and find out the connections of these processes with the implemented agricultural technologies and the soil and climatic conditions characteristic of the regions. The most common and (or) harmful, economically important weed species are identified and ways of their effective control are proposed [8-15].

The purpose of the study is to herbologically assess the current state of the main agricultural crops in the Primorsky Territory.

MATERIAL AND METHODS

Monitoring surveys were conducted annually in 2016-2020 in ten administrative districts of the Primorsky Territory in accordance with the approved instructions[2]. Crop surveys with a total area of about 20 thousand ha were conducted for the first time in a season during the mass emergence of major weed species (II-III decades of June). Each field was passed diagonally, evenly overlapping accounting frames with the area of 0.25 m^2, within which the number of weeds of each species was counted separately. Species affiliation of weeds was determined according to the publications [16, 17]. The second time during the season, the crops were examined in August to confirm the data of the first survey and to obtain the final information on the weed component of agrophytocenoses.

The degree of general weed infestation was determined according to the scale proposed by V.V. Isayev: the number of weeds up to 5 pcs/m^2 - very weak; 5.1-15.0 - weak; 15.1-50.0 - medium; 50.1-100.0 - strong and more than 100 pcs/m^2 - very strong [18].

The occurrence of each weed species was calculated using the formula

$$V = \frac{a \times 100\%}{n},$$

where V is the species occurrence in the surveyed territory, a is the number of surveyed habitats where the species was registered, n is the total number of surveyed habitats [19]. Weed species differing in frequency of detection were divided into groups. The predominant weed species with high occurrence in the entire surveyed area and (or) in the crops of individual crops were singled out.

Average weed density (weed stand density) was calculated taking into account the total area of the surveyed crops according to the formula

$$\mathrm{AD} = \frac{\Sigma_{i=1}^{n} Pi \times Si}{\Sigma_{i=1}^{n} Si},$$

where AD is the average species density, Pi is the density of plants of this species per field (pieces per square meter of sowing), Si is the area of the surveyed field, n is the total number of surveyed fields[3].

RESULTS AND DISCUSSION

Phytosanitary monitoring of crops in the Primorsky Territory, conducted in 2016-2020, revealed a high level of general weed infestation in soybeans, early grains (wheat, barley, oats) and corn (see Table 1).

The main characteristic of the weed flora is the botanical spectrum of its constituent species. Previously, as a result of research conducted by FERIPP staff in 2006-2015 in four

[2]Instruction for determining fields, perennial plantations, cultivated hayfields and pastures. Moscow: Agropromizdat, 1986. 15 p.

[3]Vostrikova S.S., Morokhovec V.N., Morokhovec T.V., Basaj Z.V., Shterbolova T.V. Dynamics of soybean agrocenosis component in the Primorsky Territory. Scientific support of soybean production: problems and prospects Blagoveshensk: IPK "ODEON" LLC, 2018. pp. 131-140.

natural-climatic zones of the Primorsky Territory, 88 species of weeds of 29 families were registered in crops of major agricultural crops (soybean, spring cereals, and corn). In soybean crops, 80 species were detected. In agrocenoses of early cereals and maize, 73 and 52 species were recorded, respectively. The most frequent weeds annually registered on 70-100% of the surveyed areas were barnyard grass *Echinochloa crusgalli* (L.) Beauv, copper leaf *Acalypha australis* L, field sow thistle *Sonchus arvensis* L., common lamb's quarters *Chenopodium album* L., ragweed *Ambrosia artemisiifolia* L., and yellow thistle *Cirsium setosum* (Willd.) Bieb[4]. The same species were characterized by high density of growth, occurring in the surveyed fields in the maximum quantities, and were most widely and abundantly represented in the crops of all crops [15].

In 2016-2020, 111 species of weeds belonging to 33 botanical families were found in the surveyed areas. The largest number of species (24) belongs to the family Asteraceae Dumort. Then, in descending order by the number of species represented, the families of bluegrass Poaceae Barnhart (15 species), knotgrass Polygonaceae Juss. (11), beans Fabaceae Lindl. (9), cabbage Brassicaceae Burnett (8), carnation Caryophyllaceae Juss. (7), mint family Lamiaceae Lindl. (5), the bindweed Convolvulaceae Juss., and the pink Rosaceae Juss. - three species each. Primulacea Vent. and Malvaceae Juss. were represented by two species each, the other 22 families by one species.

The species composition of weeds largely depends on the biology and cultivation technology of crops. The floristic composition of soybean agrocenoses was the widest - 108 weed species of 31 families. In grain and maize crops the diversity of weeds was less considerable: 75 species in 22 families and 72 species in 25 families, respectively. All these crops were infested with plants of 62 species of 19 families.

When considering the ratio of weed groups, we found that dicotyledonous plants significantly outnumbered monocotyledonous plants - 92 species (84% of the total recorded number) against 19. Among dicotyledonous weeds, 55 species were short-lived plants and 37 were perennial. Monocotyledonous weeds were represented by 10 short-lived and 9 perennial species. Minor dicotyledonous species were the predominant group in soybean, spring grain crops, and corn cenoses. In particular, the ratio of minor and perennial dicotyledonous species in soybean crops was 54: 35, in early cereal crops 39: 25, and in maize 37: 26. In soybean agrocenoses, 10 perennial and 9 perennial monocotyledonous weed species were observed. Grain crops and maize were infested by 6 species of small annual weeds and by 5 and 3 perennial annual weeds, respectively.

The main weeds that grew in 97-99% of the surveyed area at a fairly high average standing density (21-61 pcs/m^2) were copper leaf, barnyard grass (barnyard millet), and ragweed (see Table 2). Taken together without other weeds 3 plant species formed a strong (on average - 73,6 pcs. /m^2) weed infestation of maize and very strong (120,3-150,6 pcs. /m^2) - of cereals and soybean. In soybean crops, copper leaf and

Табл. 1. Общая засоренность сельскохозяйственных культур в Приморском крае (среднее за 2016–2020 гг.), % от обследованной площади

Table 1. Total weed contamination of agricultural crops in Primorsky Territory (average for 2016–2020), % of the area studied

Crop	Degree of weediness				
	very weak	weak	medium	strong	very strong
Soy	0,8	–	4,3	22,6	72,3
Early ripening grain crops	–	–	9,5	17,8	72,7
Corn	–	–	16,5	35,5	48,0
The entire survey area	0,6	–	6,0	26,8	66,6

[4]Morokhovets T.V., Morokhovets V.N., Vostrikova S.S., Basay Z.V., Shterbolova T.V. Evaluation of weed frequency in crops of the Primorsky Territory. Protection of grain crops from diseases, pests, weeds: achievements and problems. Bolshiye Vyazemi, 2016. pp. 141-156.

barnyard grass dominated quantitatively. Cereal crops were most densely infested by ragweed. The minimum total weed infestation of copper leaf, barnyard grass and ragweed was detected in corn crops.

Also, in the whole surveyed area with high occurrence (on average, more than 50%) were found hairy cupgrass *Eriochloa villosa* (Thunb. ex Murray) Kunth, field thistle, wheatgrass *Elytrigia repens* (L.) Nevski, common lamb's quarters, wormwood species (common *Artemisia vulgaris* L., red-footed *A. rubripes* Na-Kai, Sivers *A. sieversiana* Willd.), field horsetail *Equisetum arvense* L., yellow thistle, dayflower *Commelina communis* L., and bristle grass *Setaria pumila* (Poir.) Schult. (S. glauca (L.) Beauv.) Practically all listed species are widespread in soybean, cereal crops and corn. Only field horsetail in early cereals (48%) and bristle grass in maize (48%) were found with frequency of occurrence below 50%. Average abundance of most species of this group in crops was 1.51-13.03 units/m^2. In the quantity of less than 1 pc/m^2 we recorded yellow thistle on early cereals and wormwood (species) - in crops of maize.

Velvetleaf *Abutilon theophrasti* Medik., curly sorrel *Rumex crispus* L., rough hedge woundwort *Stachys aspera* Michx., clover species (meadow or red *Trifolium pratense* L., lupin *T. lupinaster* L., field *T. campestre* Schreb., creeping or white *T. repens* L., hybrid (pink or Swedish) *T. hybridum* L., arable *T. arvense* L.), trailing hollyhock *Hibiscus trionum* L., swamp plantain *Plantago uliginosa* F.W. Schmidt, green bristle grass *Setaria viridis* (L.) Beauv., pyrethrum *Tripleurospermum inodorum* (L.) Sch. Bip., spotted knotweed *Persicaria maculosa* S.F. Gray, marsh cress *Rorippa palustris* (L.) Bess., siegesbeckia *Sigesbeckia pubescens* Makino, common reed *Phragmites australis* (Cav.) Trin. ex Steud, bur beggare *Bidens tripartita* L., wild soybean *Glycine soja* Siebold et Zucc., cat pea *Vicia cracca* L., and Mongolian dandelion *Taraxacum mongolicum* Hand-Mazz. Crop infestation density by species from this group was insignificant and averaged less than one plant per square meter of crop in 5 years. In some years, average abundance of 3 to 5 plants/m^2 was recorded for curly sorrel, marsh cress, and siegesbeckia in soybean crops, for hibiscus trifoliate, green bristle grass, and for clover and curly sorrel in early cereal crops. The maximum quantity of the bur beggare (2 pcs/m^2) was observed in soybean crops. The same amount of the marsh cress in corn crops, trailing hollyhock and Velvetleaf in maize crops were recorded in some years with the same abundance.

Average 5-year occurrence of field dodder *Cuscuta campestris* Yunck., eastern knotgrass *Persicaria orientalis* (L.) Spach, doorweed *Polygonum aviculare* L., redroot amaranth *Amaranthus retroflexus* L., radiant chickweed *Fimbripetalum radians* (L.) Ikonn, Siberian cocklebur *Xanthium sibiricum* Patrin ex Widd., waterpepper smartweed *Persicaria hydropiper* (L.) Spach, hemp nettle *Galeopsis bifida* Boenn., elsholtzia *Elsholtzia pseudocristata* Levl. et Vaniot, field mint *Mentha arvensis* L., common spurry *Spergula arvensis* L. were 11-19% with a stand density less than 1 pc/m^2. Some of these species were more widespread in individual crops. For example, field dodder, redroot amaranth and radiant chickweed Fimbripetalum radians (L.) Ikonn were more common in soybean crops than in other crops. Hemp nettle was the most frequent in early cereal crops, while eastern knotgrass, doorweed and Siberian cocklebur were more common in maize crops.

The following 11 species of weed plants (bladder campion *Oberna behen* (L.) Ikonn., Siberian crane's bill *Geranium sibiricum* L., Japanese hop *Humulus japonicus* Siebold et Zucc. Love, climbing buckwheat *Fallopia convolvulus* (L.) A. Love, common shepherd's purse *Capsella bursa-pastoris* (L.) Medik., rock jasmine *Androsace filiformis* Retz., annual knawel *Scleranthus annuus* L., rocket cress *Barbarea arcuata* (Opiz ex J. et C. Presl) Reichb, Canada fleabane *Conyza canadensis* (L.) Cronq., black nightshade *Solanum nigrum* L., wartwort *Gnaphalium uliginosum* L.) were found in 5-10% of agricultural areas, mostly with an average number of less than 1 pc/m^2. Only for the rock jasmine and annual knawel average abundance values were registered slightly higher - 4.99 and 1.02 pcs/m^2, respectively. Standing density of the rock jasmine in 2019 and 2020

Табл. 2. Основные засорители посевов сельскохозяйственных культур в Приморском крае (среднее за 2016–2020 гг.)
Table 2. The main weeds of crops in Primorsky Territory (average for 2016-2020)

Weed plant	Occurrence, %				Abundance, pcs. /m2			
	in all crops	including in the crops of			in all crops	including in the crops of		
		soy	early ripening grain crops	corn		soy	early ripening grain crops	corn
Copper leaf	99	99	98	100	60,74	70,44	36,14	32,26
Barnyard grass	98	97	100	100	52,08	59,52	52,90	23,18
Ragweed	97	90	98	100	20,87	20,64	31,27	18,12
Hairy cupgrass	86	85	79	68	9,05	9,47	5,51	9,61
Field sow thistle	83	85	85	76	4,60	5,27	5,84	2,44
Wheatgrass	77	84	63	67	13,03	15,09	2,98	9,38
Common lamb's quarters	75	77	67	71	7,06	8,78	5,25	1,59
Wormwood, species	69	75	55	58	1,51	1,74	0,94	0,20
Field horsetail	69	70	48	82	5,55	8,13	3,56	7,19
Yellow thistle	69	67	58	80	2,01	1,82	0,69	3,50
Dayflower	62	59	58	77	2,40	1,84	2,71	4,39
Bristle grass	54	54	61	48	2,29	1,64	5,23	1,22
Velvetleaf	48	49	53	36	0,74	0,71	0,59	0,87
Curly sorrel	43	45	34	40	1,72	2,10	0,84	0,68
Rough hedge woundwort	37	36	37	41	0,70	0,82	0,35	0,53
Clover, species	37	38	53	16	0,39	0,45	1,04	0,08
Trailing hollyhock	32	28	29	44	1,05	0,67	1,95	1,16
Swamp plantain	32	33	41	22	0,53	0,57	0,37	0,18
Green bristle grass	31	32	48	14	0,49	0,48	1,22	0,24
Pyrethrum	30	31	36	18	0,37	0,40	0,34	0,39
Spotted knotweed	28	27	25	40	0,42	0,43	0,27	0,48
Marsh cress	28	30	18	19	1,17	1,42	0,52	0,17
Siegesbeckia	28	33	19	16	1,04	1,35	0,37	0,19

Ending table. 2

Common reed	27	33	14	12	0,70	0,73	0,23	0,63
Bur beggare	26	26	29	22	0,72	0,80	0,39	0,50
Wild soybean	26	32	13	14	0,64	0,83	0,43	0,11
Cat pea	23	23	35	14	0,24	0,26	0,27	0,14
Mongolian dandelion	20	23	3	22	0,43	0,55	0,01	0,21
Field dodder	19	26	5	4	0,15	0,18	0,05	0,08
Eastern knotgrass	18	16	16	32	0,49	0,42	0,25	0,91
Doorweed	18	14	13	41	0,15	0,09	0,12	0,35
Redroot amaranth	17	22	5	8	0,93	1,27	0,01	0,06
Radiant chickweed	17	20	3	10	0,42	0,57	0,01	0,09
Siberian cocklebur	15	13	7	34	0,21	0,17	0,06	0,42
Water-pepper smartweed	14	12	15	20	0,23	0,21	0,45	0,22
Hemp nettle	12	11	23	6	0,24	0,28	0,26	0,08
Elsholtzia pseudocristata	12	13	8	4	0,32	0,41	0,16	0,08
Field mint	12	14	7	13	0,34	0,45	0,38	0,14
Common spurry	11	10	16	5	0,89	0,89	1,45	0,77
Bladder campion	9	10	10	4	0,16	0,11	0,71	0,07
Siberian crane's bill	9	9	7	8	0,04	0,04	0,03	0,04
Japanese hop	8	8	11	4	0,07	0,09	0,01	0,01
Climbing buckwheat	8	4	9	27	0,15	0,03	0,05	0,72
Common shepherd's purse	8	9	5	2	0,59	0,84	0,05	0,02
Rock jasmine	8	10	2	3	4,99	8,39	0,07	2,04
Annual knawel	7	7	10	7	1,02	1,12	1,78	0,60
Rocket cress	7	6	8	11	0,07	0,06	0,01	0,04
Canada fleabane	6	9	4	–	0,12	0,16	0,02	–
Black nightshade	6	6	2	8	0,09	0,11	0,004	0,10
Wartwort	5	4	9	2	0,74	0,72	2,20	0,01

in soybean crops was equal or exceeded 21 pcs/m^2, and the abundance of annual knawel in 2016 in early cereal crops reached 8.71 pcs/m^2.

The group of rare weeds with occurrence of more than 1% and less than 5%, density of growth not more than 0.35 pcs/m^2 included 25 species: shining hoarhound *Lycopus lucidus* Turcz. ex Benth., American sloughgrass *Beckmannia syzigachne* (Steud.) Fern., carrot *Daucus carota* L., small-flower galinsoga *Galinsoga parviflora* Cav, narrow-leaved hawkmoth *Crepis tectorum* L., bindweed *Calystegia inflatata* Sweet, common thymothy *Phleum pratense* L., oatgrass *Avena fatua* L., sedge *Carex* sp., trailing bindweed *Convolvulus arvensis* L., common evening primrose *Oenothera biennis* L, common chickweed, satinflower *Stellaria media* (L.) Vill., sanguinary *Achillea millefolium* L., field buttercup *Ranunculus acris* L., purple sandwort *Spergularia rubra* (L.) J. et C. Presl, silverweed cinquefoil *Potentilla anserina* L., ball mustard *Neslia paniculata* (L.) Desv., common burdock *Arctium lappa* L., umbrella rock jasmine *Androsace umbellata* (Lour.) Merr, Japan metaplexis *Metaplexis japonica* (Thunb.) Makino, prickly grass *Echinochloa oryzoides* (Ard.) Fritsch, bluegrass *Poa pratensis* L., field pennycress *Thlaspi arvense* L., clammy smartweed *Persicaria viscofera* (Makino) H. Gross ex Nakai, fleabane *Phalacroloma annuum* (L.) Dumort.

The group of extremely rare weeds included 29 species detected in less than 1% (0.22-0.78%) of the surveyed areas: willow-leaf inula *Inula salicina* L., knotweed Bungea mountaineer *Persicaria bungeana* (Turcz.) Nakai ex Mori, common purslane *Portulaca oleracea* L, silvery cinquefoil *Potentilla argentea* L., Aleppo geum *Geum aleppicum* Jacq., blue bottle flower *Centaurea cyanus* L., Tartary buckwheat *Fagopyrum tataricum* L., *Hieracium umbellatum* L, cattail *Typha latifolia* L., yellow cress *Erysimum cheiranthoides* L., lovegrass *Eragrostis* sp., Siberian morning glory *Ipomoea sibirica* (L.) Pers, wild radish *Raphanus raphanistrum* L., field violet *Viola arvensis* Murr., oxtongue *Picris* sp., common or linear crabgrass *Digitaria ischaemum* (Schreb.) Muehl., large crabgrass *Digitaria sanguinalis* (L.) Scop., cereal chickweed *Stellaria graminea* L., spreading knotweed *Persicaria lapathifolia* (L.) S.F. Gray, long-bristle knotweed *Persicaria longiseta* (De Bruyn) Kitag, small-flowered beggar-ticks *Bidens parviflora* Willd., clump speedwell *Veronica longifolia* L., squirreltail critesion *Critesion jubatum* (L.) Nevski, killweed *Lythrum salicaria* L., Tartar prickly lettuce *Mulgedium tataricum* (L.) DC., water plantain, plantain *Alisma plantago-aquatica* L., viper's bugloss *Echium vulgare* L., field mustard *Sinapis arvensis* L., groundnut peavine *Lathyrus tuberosus* L. These weed species are mainly found in soybean crops with a maximum density of one plant per 4 m^2, most often one plant per 1000-10 000 m^2.

CONCLUSION

Monitoring surveys 2016-2020 showed that the species composition of plants infesting soybean, early grain crops and corn is very diverse and represented by 111 species of 33 families. Compared with the results of the crop surveys conducted in 2006-2015, there was an increase in the total number of species detected. For the first time weed representative of figwort, violet, lythrum, evening primrose (willowherb), milkweed and borage families were found. Prevalence and density of some weed species increased. On the surveyed areas there was a 10-58% increase in occurrence of barnyard grass, wormwood species, field horsetail, dayflower, curly sorrel, wild soybean, field dodder and bird's knotweed. In crops of soybean, early cereal crops and maize the prevalence of couch grass increased by 1.4-4.6 times in 5 years, and of hairy cupgrass by 1.7-3.2 times. Average weed infestation of crops by hairy cupgrass, curly sorrel, scurfy woundwort, marsh cress, wild soybean, bird's knotweed and common spurry increased by 1.5-3.0 times. Less common and in smaller numbers were lamb's quarters, yellow thistle, China jute, Siguezbeekia velvet, bur beggare, Mongolian dandelion and hemp nettle. In 2016-2020, the composition of weed species prevailing in crops was observed to be almost the same. The occurrence rates, abundance of each species, determining its specific place in the dominant group of weeds, var-

ied every year. The most widespread and prevalent weed species in the Primorsky Territory are the Southern copper leaf, barnyard grass and ragweed against which effective control must be provided by the implemented protective measures.

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