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GARDENS OF "NEW WAVE" AS A NEW TREND IN BEAUTIFICATION AND PLANTING

Solovey D.S., a graduate student*[1]

There was analyzed the seed germination of some perennial (Cortaderia selloana Schult., Erianthus ravennae Schult., Miscanthus sinensis `Goliath`, Penisetum alopecuroides Schult., Festuca glauca L., Stipa tenuissima L., Chasmanthium latifolium L., Hordeum jubatum L.) and annual (Sorgum nigrum 'Safari', Setaria italica L., Panicum violaceum 'Primo') ornamental grasses in the open ground conditions.

Ornamental grasses, seed germination, open ground, gardens of "New Wave", grassy gardens

Today one can observe extremely diverse number of stylistic features in the public welfare of any country of the world. When selecting the style of garden, designers are guided by both climatic characteristics of the region to be planted and purpose of an area, the owners' desires and a number of factors that sometimes complicate the task for even experienced gardeners. However, there is the certain type of gardening which increasingly gains popularity. This type of gardening presupposes that it is not necessary to wait years to achieve full decoration of territory and where the care after plants is minimized.

Figure 1. Example of "New Wave" garden.

In the beginning of XXI century the Danish landscape architect Peter Udolf thought about the idea of landscape garden, where a person does not copy nature but brings a sense of nature in the garden. In his view, the

[*]Research supervisor – Doctor of Agriculture, prof. S. Kowalewski

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main idea of any garden is its emotional component. Any landscaped area should bring a sense of balance and calm for a visitor, it should inspire him with contemplation and reflection. Tools of the garden are its structure and form, the second important thing is color, after it when a shape is selected, then suitable size and texture of the plant is chosen [4]. Udolf P. became the founder of stylistic trend that was called the «New Wave» and took into consideration the abovementioned principles of a garden planning. Key plants in the garden "New Wave" are ornamental grasses, supplemented with perennial flower crops. It is important to assert that such gardens serve their decorative function throughout the year. Udolf P. teaches to see aesthetics even in the dead plants in the winter period and emphasizes not do pruning of dead shoots for a long time from the beginning of the summer blossom until the next spring [4].

The aim of the research is to identify the possibility of planting material cultivation for the creation of gardens of the "New Wave" in the open ground conditions without the use of growth promoters and feed, as well as to evaluate the relation of some ornamental grasses to different soil conditions on the example of turf mixes and gray forest soils.

The object of research is areas under investigation in the nursery NUBiP of Ukraine "Boyarsky College of Ecology and Natural Resources".

The subject of study is the seed of some perennial (Cortaderia selloana Schult., Erianthus ravennae Schult., Miscanthus sinensis `Goliath`, Penisetum alopecuroides Schult., Festuca glauca L., Stipa tenuissima L., Chasmanthium latifolium L., Hordeum jubatum L.) and annual (Sorgum nigrum 'Safari', Setaria italica L., Panicum violaceum 'Primo') ornamental grasses.

Cereals can be regarded as the most successful group of plants that cover much of the territory and feed more wildlife than any other group on the planet. Cereals grow successfully on every continent, in entirely different natural conditions, which says about their versatility and simplicity as for their environmental conditions of growth [5].

In Europe grassy gardens occupy a worthy place among the one flower gardens (mono gardens) of other types (rose gardens, lilac gardens, tulip gardens), as well as among gardens where brushwood, trees and flower plant species dominate. Nevertheless, in Ukraine to date all the works are associated with the study of cereals aimed at their use in feeding. In terms of decorative function grasses are not currently taken into consideration.

The issues involved in cereals such scholars: K.A. Trinius, N. Tsvyelyev, P.S. Pallas, A. Hrizebah, RY. Rozhevits, S.A. Nevsky, P. Ovchinnikov, V.I. Krechetovich, E.G. Bobrov, N.F. Goncharov, W.J. Komarov, E.M. Lavrenko, B.K. Shishkin, A.I. Vvedenskyi V.B. Sochava, V.L. Nekrasov, A.N. Krishtofovich and I.V. Larin, G. Pashkevych, N. Trojanskaja, N. V. Demydova [1].

Cereals started to being used actively in the garden in XIX century. Foreign cereal lovers were: Englishman William Robinson, Gertrude Jekyll, Jacques P. Tiysse. It was the time when it was announced not to mow grass in gardens that was created in imitation of nature.

Cereals gained height of their fame after 1957, when the book of the German gardener, Karl Forster “Cereals and ferns - new plants for the garden”. After Forster question of cereal gardens was studied by the following gardeners: Wolfgang Ehmeya, James Van Zvedeno, Rosemary Weiss, and many others.

Ornamental grasses are annual and perennial herbs with fibrous root system, their stem is a straw. Leaves are linear, with parallel venation, sessile. The flowers are small, anemogamous, basically monoecious. Inflorescence of slim-legged is usually - a complex spike. We know about 11 000 species, 340 of which one can find in Ukraine. Decorative ones are more than 600 species [2].

According to the color of the leaves, cereals are conventionally combined in the following groups: types and varieties with green leaves, blue-grey, copper-brown group poecilophyllous species. According to height grasses are divided into low-growing (height of shoots 20-25 cm), grasses of average height (30-80 cm), and tall-growing (85-200 cm). Cereals bloom from early spring to late autumn. In terms of flowering grasses are distinguished between early flowerings (earing and flowering:

end of May - beginning of June), middle flowering (late June - early July), late flowering (August) [3]. Cereals are propagated by cereal seed in April and May in open ground or in a greenhouse during the winter.

Selection plant assortment for the garden of "New Wave" is followed by an analysis of these types concerning their accrescence, because it is a major problem of cereals. Species that grow rapidly and thus inhibit the growth of neighboring plants are planted in a metallic ring. When cereals are selected ecological and decorative factors are also taken into consideration.

Materials and methods research. To date, cereals are propagated by seeding in open ground only in large areas in order to feed, ornamental species of the cereal family (Latin Poáceae) propagated vegetatively by bush dividing.

Such technology is conditioned primarily by low grass seed germination that sown singly as well as by its small size.

In the spring of 2013 at the nursery NUBiP of Ukraine "Boyarsky College of Environment and Natural Resources" research areas were founded with an aim to study cultivation peculiarities of planting material for the creation of a "New Wave" garden in the open ground conditions. In order to conduct research concerning the relation of ornamental grasses to soil conditions in the second half of May there were sown the seeds of perennial cereal crops on two types of soil: turf mixes (turf : soil at a ratio 1:1) and local grey forest soils. Plot was pretreated by herbicide "Uragan" Syhenta at a concentration of 100 mg * 10 liters There were selected 8 species of perennial ornamental grass plants with different seed size (from 0.5 to 9 mm). Among them Pampas grass (Cortaderia selloana *Schult.*), Eriantus rovensky (Erianthus ravennae *Schult.*), Miscanthus sinesis `Goliath` (*Miscanthus sinensis `Goliath`*), Penisetum (Penisetum alopecuroides *Schult.*), Blue-grey Fescue (Festuca glauca *L.*), Stipa (Stipa tenuissima *L.*), Chasmanthium (Chasmanthium latifolium *L.*), Foxtail Barley (Hordeum jubatum *L.*).

1. The epigenetics of seed shoots of some perennial ornamental grasses

№	Species	Seed size, (length*width) mm	period of shoots' emergence in close ground conditions **, days	The epigenetics in open ground conditions at the plot under research, cm									
				1-7 day		8-14 day		15-21 day		22-28 day		The height of mature plant in the end of vegetation	
				T	G	T	G	T	G	T	G	T	G
1	Cortaderia selloana	1,1*0,1	21-42	-	-	-	-	-	-	-	-	-	-
2	Erianthus ravennae	1,1*0,1	7-14	-	-	-	-	-	-	-	-	-	-
3	Miscanthus sinesis `Goliath`	3,0*1,0	14-21	-	-	-	-	-	-	-	-	-	-
4	Penisetum alopecuroides	7,0*2,0	14-21	-	-	1-2	3-5	3-5	7-9	7-9	12-15	110-120	110-120
5	Festuca glauca	2,5*0,8	5-7	-	-	-	-	-	-	-	-	-	-
6	Stipa tenuissima	1,5*0,5	7-10	-	-	-	-	-	-	-	-	-	-
7	Chasmanthium latifolium	9,0*2,0	7-12	-	-	-	-	-	-	-	-	-	-
8	Hordeum jubatum	4,0*1,5	7-10	-	-	-	-	-	-	0,5 - 1	3 - 5	8-10	8-10

Note: T –turf mixture; C –grey forest grounds; «-» -shoots did not emerge;
Seed size, arithmetic average was taken;
** period of shoots'emergence was taken from information provided by seed manufacture

Seeds of two types, namely Penisetum foxtail and Penisetum grey sprouted respectively at 10th and 12th days. Shoots of Stipa Tenuissima appeared at 22th days from sowing, which is much later than normally in 7-10 days. Other types of did not shoot. Based on the results of the research that are described in Table 1, it can be concluded that there were achieved poor results of germination of perennial ornamental grass crops in the open ground conditions without the use of growth promoters and feed.

Figure 3. Penisetum foxtail at the experimental site. August 2013.

Low percentage of germination in the open ground is conditioned by the range of factors.

During the seeding no growth promoters were used and there were also no pre-sowing seed preparation with an aim accelerate germination (stratification,

scarification, etc.). We were provided with the conditions of non-interference in the formation of plants by seed seedling in the open ground, in order to determine the capacity of the creation of planting material with minimum resources and manpower. Also, the results of the research show that the shoots on grey forest soils grew faster than turf mixes. However, according to results that were obtained in August, the plants resembled on both types of soil conditions.

In addition, there were created plot under research with mixture of annual ornamental cereal crops that were sown as a lawn grass. The name of ornamental grasses mixture that was taken is brand «Gl Seeds». The seeding technology was the same as for creating a conventional landscape gardening lawn. Mixtures were sown by hand by spreading seeds on packed soil from right to left horizontally and from left to right vertically. Seeding density was performed at the rate of 35 g/m^2. The result of this research is a plot with annual ornamental grass with the height of 0,6-0,7 m. According to the results of the research, we can conclude that annual grasses gave a high percentage of germination in the open ground, but prior to the beginning of earing served as poor decorative function. This indicates the possibility of creating a mixture of ornamental grass plots in the “New Wave” gardens in small amounts as part of the unspoiled natural garden, but eliminates the possibility of creation of such gardens by seeding grass mixtures.

Figure 4. Experimental plot of ornamental grasses grass mixtures. August 2013року.

Annual decorative cereals are also grown for the creation of dried flowers.

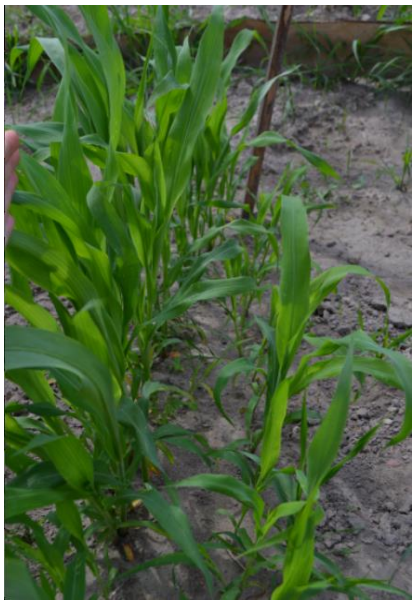

Figure 5. Sorghum seedlings black after the picks. To the left - transplanted, to the right - not transplanted. 7 days after the picks.

Annual decorative cereals are also grown for the creation of dried flowers. To create a plot of annual cereal crops the following species were chosen: red durra 'Safari' (Sorgum nigrum 'Safari'), setarias Italian (Setaria italica L.) and panic Grass 'Primo' (Panicum violaceum 'Primo'). Shoots appeared 8 days after sowing. A week after the first shoots of red durra appeared, a trimming was made. As a result, transplanted seedlings grew worse than those ones that were not transplanted.

According to the results of this research (Table 2) one can see that the soil conditions of an area do not affect the growth of annual ornamental grass crops. Also, it can be concluded that perennial ornamental grasses when sown in the open ground without the use of growth promoters and feed give a low percentage of germination, annual grasses also provide a high percentage of germination when sown in the open ground.

For the spring of 2014 we plan to organize the research plots once more. There will be performed researches on seed germination, relation to different soil conditions alelopatic capacities, identification of the regeneration extent and characteristics of decorative features. The aim of the study is to establish the ability to create and use “New Wave” gardens in conditions of Kiev hill in steppes of Ukraine.

2. The epigenetics of seed shoots of some annual ornamental grasses

№	Species	Seed size, (length*width) mm	period of shoots' emergence in close ground conditions **, days	The epigenetics in open ground conditions at the plot under research, cm									
				1-7 day		8-14 day		15-21 day		22-28 day		The height of mature plant in the end of vegetation	
				T	G	T	G	T	G	T	G	T	G
1	Panicum violaceum 'Primo'	5,0*2,0	8-10	-	-	3-5	3-5	12-15	12-15	25-30	25-30	110-120	110-120
2	Setaria italica	2,0*1,8	8-10	-	-	2-3	2-3	10-12	10-12	15-20	15-20	100-105	100-105
3	Sorgum nigrum 'Safari'	6,0*3,0	8-10	-	-	3-5	3-5	15-20	15-20	25-30	25-30	150-165	150-165

Note: T –turf mixture; C –grey forest grounds; «-» -shoots did not emerge;
Seed size, arithmetic average was taken;
** period of shoots' emergence was taken from information provided by seed manufacture

Conclusion. "New Wave" Gardens is quite promising stylistic trend. Currently, the lack of free time makes one search for a solution concerning landscaping with wasting minimal labor costs, time and money. "New Wave" Gardens make it possible not to wait many years until garden is fully decorated (as ordinary garden does), and allow you to get ready garden within one growing season.

However, creating such gardens by seeding of perennial ornamental grasses in open ground without growth stimulants and feeding is inadvisable, since the results of researches; most of the perennial ornamental grasses provide low germination. Annual grasses though provide a high germination in such conditions. It is therefore advisable to create separate plots of "New Wave" gardens, using seeds of annual ornamental grass plants by sowing in the open ground.

Thus, ornamental grasses quickly gain the same mien as the turf soils and the grey forest soils, which make it possible to affirm that ornamental grasses are versatile in relation to soil conditions.

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