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*ORIGINAL ARTICLE*

# The study of source material for selection of white clover in the conditions of precarpathian

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White clover *(Trifolium repens L.)* is one of the most important forage legumes because of its large spread, good adaptability, high nutritive value and by its nitrogen-fixing capacity. It is adaptable to a wide range of soil and environmental conditions and combines well with many perennial grasses. This is an irreplaceable pasture grass. Increasing the efficiency of clover sowing is possible due to the improvement of selection work, because the main role in the implementation and use of this crop in production belongs to the variety. As we know, successful selection work with any agricultural plant depends on the correct selected source material and the effectiveness of the selection of parental forms. Therefore, the study of collection samples of white clover and the selection of promising forms for breeding is a topical issue today.

The three-year results of selection work with white clover in a collection nursery are presented in the article. The material for the study were 30 samples from 5 countries: Ukraine-20, Lithuania-6, Russia-2, Sweden-1, Germany-1. The research was conducted in soil and climatic conditions of Precarpathian. The characteristics of the studied samples of white clover for the main economic and valuable features are given. According to the results of the study, promising samples have been identified that can serve as a valuable source material for further selection work: by the yield of green mass during hay way of use (7 samples), by dry matter (8 samples), by seed productivity (5 samples), by leafiness (5 samples), by plant height (9 samples), by head diameter (8 samples), by the number of seeds in the head (5 samples), by weight of 1000 seeds (5 samples), by the length of peduncle (6 samples), by winter hardiness (8 samples), by resistance to powdery mildew (11 samples).

**Keywords:** White clover, Selection, Breeding number, Collection, Source material, Variety, Productivity.

## Introduction

A promising direction in the system of increasing the productivity of forage lands is the use of biological features of plants. Therefore, special attention of specialists is drawn to perennial grasses, especially legumes. They make it possible to receive cheap, biologically complete feed without the application of expensive nitrogen fertilizers, improve soil fertility, and reduce energy costs in agriculture (Piskovatskaya et al., 2016; Antypova et al., 2018). Along with the widespread high-protein crops in the west of Ukraine (lucerne, sainfoin, bird's foot trefoil, red clover) the greatest interest in the creation of cultivated pastures has white clover (Petrychenko & Korniychuk, 2012, Horbkova, 2015).

White clover, *Trifolium repens L.*, is one of the most agronomically important species in the genus *Trifolium*, bean family *Fabaceae* and order *Fabales*. This is a perennial herbaceous legume. In Ukraine its crops are concentrated in Polissya, in the Western Forest-Steppe, as well as in the foothills and mountainous regions of the Carpathians. It grows almost on all types of soils. This is a water-loving plant. It has good winter hardiness and can withstand flooding. White clover is capable of vegetative reproduction through the generation of creeping stolons (hence the botanical name of the species). The stolon has two nodal root buds from which roots grow when the buds come into contact with moist soil. As a result of rooting there is a strong tillering of plants. In addition, there is also self-seeding reproduction because plants bloom from spring to late autumn. In areas with sufficient moistures white clover can be sown in early spring and in the summer period. Inflorescence is a head with numerous white flowers. Bean contains 1-6 seeds. The weight of 1000 seeds is 0.6-0.8 g (Babych, 1995; Dzyubaylo & Zaviryukha, 2004).

This is a cross-pollinated plant; its yield depends on soil fertility, variety, method of sowing and plant density, the number of honey bees, which are the main pollinators. White clover is also a good honey plant. Its vegetation period depending on soil and climatic conditions from the beginning of regrowth to flowering is 45-65 days, and from the beginning of flowering to full ripening of seeds is 40-60 days. This type of clover is more lasting than others. It is stored in pasture grasslands for ten years or more and on hayfields only three. After harvesting seeds a significant number of plants die, so in seed crops it is advisable to use white clover for one, sometimes two years. It can withstand 4-6 cycles of grazing. White clover gives high yields of green mass (up to 400 centner per hectare). Seeds are collected in the second year of life from the first mowing. The average seed yield of white clover is 1-2 centner per hectare, and under the high agricultural techniques and favorable conditions 5-6 centner per hectare and more (Zinchenko, 1985; Yakuts et al., 2001; Bond et al., 2007).

Being one of the valuable perennial legumes, growing white clover is a good way to improve soil fertility. As a legume it has a very valuable property. With the help of nodule bacteria on its roots (nodule bacteria of clover is *Rhizobium trifolii*) it absorbs molecular

nitrogen from the air and uses it to form yield. In particular, white clover accumulates biological nitrogen in the soil, which is equivalent to the application of 120-180 kg/ha of mineral nitrogen. When the plant dies, the fixed nitrogen is released making it available to other plants and this helps to fertilize the soil. Therefore white clover is one of the best precursors for all other plants of crop rotation (Zyatchina et al., 2013; Morgun & Kots, 2018).

White clover is a typical pasture plant. It is characterized by good green mass, intensive regrowth after mowing or feeding by animals. White clover is mowed on hay during full flowering because it doesn't soon become rough. Grass and hay of white clover are very nutritious, high-protein and vitamin food that is willingly eaten by all types of cattle. Clover hay, collected at the beginning of budding, contains 16-20% protein. This is one of the most valuable forage grasses that can be used in grass mixtures for pasture use. During creation the cultivated pastures with long-term use in combination with perennial ryegrass and other cereal grasses, it is an irreplaceable pasture grass (Piskovatskaya & Makaeva, 2017; Lazarev et al., 2020).

Due to the great value of white clover, the expansion of its sown areas should become an important task of agricultural production. An important role in formation of productivity of this crop belongs to the variety. This is due to the fact that the share of variety in formation the size quality of yield increases from 20-40 to 70% or more. It is the variety that allows to get high and stable yields of high quality products in certain natural and production conditions (Rudnyk-Ivashchenko, 2012). Currently, the main way to get a new high-yielding varieties is selection. It is necessary to create and implement in production varieties with high fodder and seed productivity, feed quality, resistant to main biotic factors, long-lasting to multiple use, adapted to the conditions of the growing region. Modern selection work with white clover is also aimed at creating varieties of pasture, hay or pasture and hay way of use (Piskovatskaya et al., 2015).

Selection work with any agricultural crop always begins with the formation and comprehensive study of the source material on the main economic and valuable features. The larger and more diverse the source material, the more effective will be the selection work. In this regard, the mobilization of genetic diversity of the original forms is the first and very important stage in the creation of varieties. In creating a new source material, it is important to involve more distant forms which are carriers of valuable genes and makes it possible to significantly expand the genetic base of breeding material. For this purpose, as a rule, the study of collection samples and the inclusion of the best numbers in breeding programs is conducted (Bilyavska & Rybalchenko, 2018). The source material, according to M. I. Vavilov, determines the success of breeding work, therefore the right choice and use it in selection is important. In fact, for the first time in the history of plant growing, he clearly stated the need to mobilize the genetic resources of all cultivated plants and their wild relatives for selection needs. The source material for white clover selection can be wild populations, selection varieties of domestic and foreign selection, hybrid material, mutant and polyploid forms and more (Novoselova, 1986; Ivanova, 2011). Therefore, obtaining the various source material that would meet the purpose of selection is an important stage of selection work.

## Materials and Methods

The research was conducted during 2018-2020 on the experimental basis of Precarpathian Department of Scientific Research of the Institute of Agriculture of Carpathian Region NAAS (Lishnya village, Drohobych district, Lviv region, Precarpathian zone). The soil of the experimental field is typical for this region of soddy-middle-podzolic, surface-gleyed, middle-oxides, loamy, typical for this region, formed on deluvial deposits. The main agrochemical indicators of these soils are: humus content (according to Tyurin)-1.22-1.88%, salt extract pH (potentiometric method)-4.6, hydrolytic acidity (according to Kappen-Gilkovitz)-4.23 mg.-eq. per 100 g of soil, Hr (the sum of the absorbed bases)-11.8 mg.-eq. per 100 g of soil, mobile forms of phosphorus (according to Kirsanov)-118 mg, exchangeable potassium (according to Kirsanov)-82 mg, easily hydrolyzed nitrogen (according to Kornfield)-108 mg per 1 kg of soil.

We have laid the collection nursery of white clover. The material for the study were 30 samples of white clover of domestic and foreign selection: Ukraine-20, Lithuania-6, Russia-2, Sweden-1, Germany-1. According to the biological status of the samples they were distributed as follows: 12 samples-selection varieties (including 3 collections of VIR), 12 samples-local populations created as a result of individual and mass selection, 1-hybrid population and 4-wild populations. The variety Skhidnychanka (UJ 0600799), which is included in the State Register of Plant Varieties of Ukraine, was chosen as a standard. Sowing of white clover was carried out in the summer terms. Method of sowing-wide-row. Sowing area of the plot-2 $m^2$, accounting area-1 $m^2$. Placement of plots of the experiment without repetition.

The method of laying the experiment corresponded to the generally accepted requirements for the field experiments (Dospekhov, 1985). The study of collection samples was conducted according to "Methodical instructions for breeding perennial grasses" (Voshchinin et al., 1978), "Methodical instructions for breeding and primary seed production of clover" (Shamsutdinov et al., 2002), "Formation and preservation of genetic diversity of forage and lawn grasses in Precarpathian. Methodical recommendations" (Konyk et al., 2015). Samples were evaluated for productivity, leafiness, plant height, winter hardiness, resistance to disease. Phenological observations of plant growth and development were conducted during the growing season. The yield of forage mass was carried out during hay way of use (phase of the beginning of flowering) by mowing and weighing the green mass from the entire accounting area of the plot. The yield of hay from the green mass was determined by test sheaves with the weight of 1 kg selected after mowing and dried to constant weight. Seeds were collected by hand by its threshing, cleaning and weighing separately from each plot. Structural analysis of plants was carried out on such economically valuable features as head diameter, the number of flowers in the head, the number of seeds in the head, the weight of 1000 seeds, the length of peduncle. Winter hardiness was determined by 9-point scale (9 points-the highest winter hardiness, 6 points-medium winter hardiness, 3 points-the weakest winter hardiness). Resistance to disease was also determined by 9-point scale.

The main purpose is to study the collection samples of white clover of various ecological and geographical origin to identify sources of valuable economic characteristics as a source material for further selection work.

## Results and Discussion

Precarpathian belongs to the zone of excessive moisture and is characterized by long spring, not very hot summer period, rather long autumn and relatively mild winter. The duration of the frost-free vegetation period is 170-220 days, the sum of active temperatures +10ºC-2220-2734ºC, the amount of precipitation-640-808 mm. The amount of precipitation is distributed unevenly. The most humid months, according to long-term data, are summer months when falls around 44% of annual rainfall.

Weather conditions of 2018-2020 were characterized by different temperatures and amount of precipitation and had significant differences from average long-term indicators (Fig. 1).

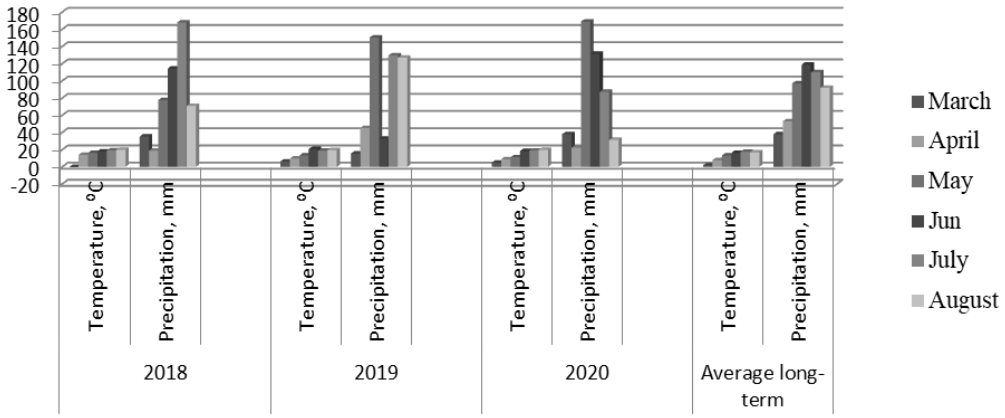


**Fig. 1.** Meteorological conditions, 2018-2020.

The length of vegetation period is an important feature of the collection sample which largely characterizes its selection value and has an important influence on the formation of fodder and seed productivity. This feature is the most ecologically variable and is determined by two main factors: on the one hand, these are the individual properties (genotype) of the sample, and on the other hand are conditions in which it growth and develops (temperature, moisture, fertility, etc.) (Kharchenko et al, 2008). Seedlings of all white clover samples in the years of sowing appeared in 7-10 days after sowing. Spring plant regrowth was observed in the second-third decades of March. Pasture maturity of collection samples on average for three years of study was in 35-54 days, and haymaking in 54-78 days from the beginning of spring vegetation renewal. The duration of vegetation period from the beginning of flowering to full ripeness of seeds on average for three years was 63-68 days. In general, the duration of vegetation period of collection samples of white clover in 2018 was 117-131 days, in 2019-127-136 days, in 2020-140-158 days. On this basis, we divided all collection samples into three groups of ripeness. We included 6 samples in the group of early ripening ones. These are 2 samples from Lithuania (UJ 0600647, UJ 0600634), a sample from Russia UJ 0600419 and three samples from Ukraine (UJ 0600440, UJ 0600658, UJ 0600691). The duration of vegetation period of these samples was 119-127 days. To the group of late ripening we included 9 samples with the duration of vegetation period 136-158 days. These are samples from Ukraine UJ 0600661, UJ 0600660, UJ 0600692, UJ 0600688, UJ 0600441, UJ 0600804, UJ 0600667, a sample from Lithuania UJ 0600633 and a sample from Sweden UJ 0600184. All other samples are medium-ripe with the duration of vegetation period 128-135 days.

Plant height is one of the important components that determine the forage productivity of white clover. By plant height before the first mowing during hay way of use (phase of the beginning of flowering), the standard (UJ 0600799-24.5 cm) exceeded the most the following samples: UJ 0600657 (Ukraine)-29.2 cm, UJ 0600796 (Ukraine), UJ 0600193 (Ukraine)-29.0 cm, UJ 0600184 (Sweden)-30.0 cm, UJ 0600437 (Ukraine)-29.5 cm, UJ 0600156 (Ukraine)-30.4 cm, UJ 0600634 (Lithuania)-30.8 cm, UJ 0600439 (Ukraine)-29.8 cm, UJ 0600657 (Ukraine)-29.2 cm. The daily growth of white clover plant height during hay way of use was 0.44-0.49 cm in the first mowing and 0.37-0.40 cm in the second mowing.

One of the most important indicators for forage crops which characterize the structure of green mass is leafiness. The higher the leafiness, the higher the yield of green mass. The leaves of the plant are the most valuable component in the biomass of forage crops which affects the quality of feed because it contains 2-3 times more protein than stems (Olifirovych, 2018). White clover is characterized by high leafiness. We found that for three years of study the leafiness of white clover plants was 55-88%. The standard (UJ 0600799-68.2%) the most exceeded samples from Ukraine such as UJ 0600661-88.0%, UJ 0600441-87.5%, UJ 0600658-80.6%, UJ 0600156-82.3%, UJ 0600437-84.2%.

The yield of green mass was carried out during hay way of use. On average for three years of study the yield of green mass in total for two mowing was 2.190-3.210 kg/m$^2$. The highest yield of green mass had samples UJ 0600810 (Lithuania)-3.040 kg/m$^2$, UJ 0600661 (Ukraine)-3.150 kg/m$^2$, UJ 0600658 (Ukraine)-3.100 kg/m$^2$, UJ 0600437 (Ukraine)-3.210 kg/m$^2$, UJ 0600441 (Ukraine)-3.166 kg/m$^2$, UJ 0600804 (Ukraine)-3.033 kg/m$^2$, UJ 0600156 (Ukraine)-3.204 kg/m$^2$ compared to the standard (UJ 0600799)-2.556 kg/m$^2$. The yield of dry matter was 0.342-0.461 kg/m$^2$. The highest yield of dry matter compared to the standard (UJ 0600799-0.375 kg/m$^2$) had the following samples of white clover: UJ 0600810 (Lithuania)-0.422 kg/m$^2$, UJ 0600661 (Ukraine)-0.453 kg/m$^2$, UJ 0600439 (Ukraine)-0.461 kg/m$^2$, UJ 0600156 (Ukraine)-0.457 kg/m$^2$, UJ 0600184 (Sweden)-0.451 kg/m$^2$, UJ 0600796 (Ukraine)-0.439 kg/m$^2$, UJ 0600688 (Ukraine)-0.435 kg/m$^2$, UJ 0600687 (Ukraine)-0.450 kg/m$^2$ (Table 1).

**Table 1.** Productivity and its structural elements of white clover samples in the collection nursery (average for 2018-2020).

| S.No | National catalogue number | Country of origin | Plant height, cm | Leafiness, % | The yield of green mass kg/m$^2$ | ± to St |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | UJ 0600799 (St) | Ukraine | 24.5 | 68.2 | 2.556 | – |
| 2 | UJ 0600810 | Lithuania | 27.1 | 83.3 | 3.040 | +0.484 |
| 3 | UJ 0600903 | Ukraine | 26.0 | 70.0 | 2.943 | +0.387 |
| 4 | UJ 0600661 | Ukraine | 23.2 | 88.0 | 3.150 | +0.594 |
| 5 | UJ 0600658 | Ukraine | 24.2 | 80.6 | 3.100 | +0.544 |
| 6 | UJ 0600793 | Ukraine | 26.6 | 78.0 | 2.766 | +0.220 |
| 7 | UJ 0600659 | Ukraine | 26.0 | 77.0 | 2.833 | +0.277 |
| 8 | UJ 0600660 | Ukraine | 28.6 | 65.2 | 2.723 | +0.167 |
| 9 | UJ 0600633 | Lithuania | 22.6 | 78.2 | 2.810 | +0.254 |
| 10 | UJ 0600647 | Lithuania | 23.0 | 68.0 | 2.737 | +0.181 |
| 11 | UJ 0600440 | Ukraine | 26.4 | 70.2 | 2.340 | -0.216 |
| 12 | UJ 0600692 | Ukraine | 25.0 | 58.2 | 2.283 | -0.273 |
| 13 | UJ 0600691 | Ukraine | 24.4 | 55.0 | 2.210 | -0.346 |
| 14 | UJ 0600657 | Ukraine | 29.2 | 74.1 | 2.870 | +0.314 |
| 15 | UJ 0600667 | Ukraine | 23.4 | 79.1 | 2.840 | +0.284 |
| 16 | UJ 0600796 | Ukraine | 29.0 | 76.1 | 2.880 | +0.324 |
| 17 | UJ 0600634 | Lithuania | 30,8 | 66.1 | 2.980 | +0.424 |
| 18 | UJ 0600636 | Lithuania | 26.6 | 73.0 | 2.683 | +0.127 |
| 19 | UJ 0600185 | Russia | 27.6 | 72.0 | 2.190 | -0.366 |
| 20 | UJ 0600687 | Ukraine | 25.4 | 75.1 | 2.910 | +0.354 |
| 21 | UJ 0600648 | Lithuania | 27.2 | 74.5 | 2.643 | +0.087 |
| 22 | UJ 0600437 | Ukraine | 29.5 | 84,2 | 3.210 | +0.654 |
| 23 | UJ 0600439 | Ukraine | 29.8 | 61,0 | 2.333 | -0.223 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 24 | UJ 0600421 | Germany | 25.0 | 78.1 | 2.886 | +0.330 |
| 25 | UJ 0600419 | Russia | 24.6 | 80.1 | 2.793 | +0.237 |
| 26 | UJ 0600688 | Ukraine | 23.4 | 77.5 | 2.720 | +0.164 |
| 27 | UJ 0600441 | Ukraine | 26,1 | 87.5 | 3.166 | +0.610 |
| 28 | UJ 0600804 | Ukraine | 26.0 | 81.0 | 3.033 | +0.477 |
| 29 | UJ 0600156 | Ukraine | 30.4 | 82.3 | 3.204 | +0.648 |
| 30 | UJ 0600193 | Ukraine | 29.0 | 66.5 | 2.190 | -0.366 |
| 31 | UJ 0600184 | Sweden | 30.0 | 76.4 | 2.726 | +0.170 |

Seed yield is a complex indicator that depends on many structural indicators of the plant. The greatest impact on seed productivity of white clover have indicators that define the structure of generative organs such as the size of the inflorescence (head), the number of flowers in the head, the number of seeds in the head, the weight of 1000 seeds (Table 2).

**Table 2.** Seed productivity and yield structure of white clover variety samples in the collection nursery (average for 2018-2020).

| S.No | National catalogue number | Country of origin | Seed yield g/m$^2$ | ± to St | Head diameter, mm | Number of flowers in the head, pcs | Number of seeds in the head, pcs | Weight of 1000 seeds, g |
|---|---|---|---|---|---|---|---|---|
| 1 | UJ 0600799 (St) | Ukraine | 11.30 | – | 22.0 | 64.7 | 71.0 | 0.62 |
| 2 | UJ 0600810 | Lithuania | 11.40 | +0.1 | 21.1 | 68.0 | 77.3 | 0.57 |
| 3 | UJ 0600903 | Ukraine | 10.40 | -0.9 | 21.8 | 54.6 | 55.0 | 0.59 |
| 4 | UJ 0600661 | Ukraine | 11.60 | +0.3 | 23.5 | 72.4 | 81.0 | 0.59 |
| 5 | UJ 0600658 | Ukraine | 11.90 | +0.6 | 23.2 | 72.0 | 62.5 | 0.60 |
| 6 | UJ 0600793 | Ukraine | 12.45 | +1.2 | 21.0 | 68.7 | 82.0 | 0.60 |
| 7 | UJ 0600659 | Ukraine | 13.00 | +1.7 | 26.8 | 81.3 | 96.0 | 0.68 |
| 8 | UJ 0600660 | Ukraine | 10.80 | -0.5 | 22.6 | 60.5 | 62.2 | 0.55 |
| 9 | UJ 0600633 | Lithuania | 12.70 | +1.4 | 25.7 | 83.0 | 98.0 | 0.66 |
| 10 | UJ 0600647 | Lithuania | 13.75 | +2.4 | 25.5 | 79.2 | 96.3 | 0.62 |
| 11 | UJ 0600440 | Ukraine | 12.10 | +0.8 | 26.8 | 67.2 | 80.0 | 0.58 |
| 12 | UJ 0600692 | Ukraine | 11.45 | +0.2 | 24.3 | 80.0 | 78.4 | 0.63 |
| 13 | UJ 0600691 | Ukraine | 11.00 | -0.3 | 20.0 | 55.4 | 61.6 | 0.55 |
| 14 | UJ 0600657 | Ukraine | 12.30 | +1.0 | 22.4 | 72.0 | 73.0 | 0.58 |
| 15 | UJ 0600667 | Ukraine | 11.55 | +0.3 | 21.3 | 69.7 | 84.2 | 0.61 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 16 | UJ 0600796 | Ukraine | 14.40 | +3.1 | 25.0 | 75.2 | 102.0 | 0.77 |
| 17 | UJ 0600634 | Lithuania | 12.00 | +0.7 | 25.5 | 82.0 | 89.7 | 0.70 |
| 18 | UJ 0600636 | Lithuania | 14.00 | +2.7 | 21.0 | 67.0 | 99.8 | 0.78 |
| 19 | UJ 0600185 | Russia | 13.10 | +1.8 | 20.0 | 71.0 | 89.0 | 0.67 |
| 20 | UJ 0600687 | Ukraine | 10.60 | -0.7 | 22.2 | 58.0 | 66.0 | 0.54 |
| 21 | UJ 0600648 | Lithuania | 11.85 | +0.5 | 20.7 | 60.0 | 72.6 | 0.66 |
| 22 | UJ 0600437 | Ukraine | 10.70 | -0.6 | 23.1 | 52.0 | 60.0 | 0.58 |
| 23 | UJ 0600439 | Ukraine | 14.25 | +2.9 | 22.0 | 75.6 | 100.4 | 0.78 |
| 24 | UJ 0600421 | Germany | 13.68 | +2.4 | 23.4 | 86.0 | 92.4 | 0.74 |
| 25 | UJ 0600419 | Russia | 11.20 | -0.1 | 23.0 | 66.0 | 52.2 | 0.64 |
| 26 | UJ 0600688 | Ukraine | 13.15 | +1.8 | 25.0 | 79.2 | 107.0 | 0.66 |
| 27 | UJ 0600441 | Ukraine | 13.40 | +2.1 | 23.0 | 81.0 | 99.4 | 0.70 |
| 28 | UJ 0600804 | Ukraine | 14.10 | +2.8 | 26.0 | 81.3 | 111.2 | 0.78 |
| 29 | UJ 0600156 | Ukraine | 13.90 | +2.6 | 24.0 | 78.0 | 103.2 | 0.75 |
| 30 | UJ 0600193 | Ukraine | 10.90 | -0.4 | 23.6 | 56.0 | 59.0 | 0.60 |
| 31 | UJ 0600184 | Sweden | 12.20 | +0.9 | 27.5 | 75.5 | 88.0 | 0.64 |

On average for three years of study, the seed yield of the studied samples ranged from 10.40 to 14.40 g/m$^2$. 23 samples exceeded the standard by 0.1-3.1 g/m$^2$. The following samples were selected according to the seed yield: UJ 0600796 (Ukraine)-14.40 g/m$^2$, UJ 0600636 (Lithuania)-14.00 g/m$^2$, UJ 0600439 (Ukraine)-14.25 g/m$^2$, UJ 0600804 (Ukraine)-14.10 g/m$^2$, UJ 0600156 (Ukraine)-13.90 g/m$^2$. Seed productivity of the standard was 11.30 g/m$^2$.

By the diameter of the head, 7 samples were selected: UJ 0600804 (Ukraine)-26.0 mm, UJ 0600184 (Sweden)-27.5 mm, UJ 0600440, UJ 0600659 (Ukraine)-26.8 mm, UJ 0600634 (Lithuania)-25.5 mm, UJ 0600633 (Lithuania)-25.7 mm, UJ 0600688, UJ 0600796 (Ukraine)-25.0 mm with head diameter of the standard (UJ 0600799) 22.0 mm.

By feature "the number of seeds in the head" 5 samples were selected: UJ 0600796 (Ukraine)-102.0 pcs., UJ 0600439 (Ukraine)-100.4 pcs., UJ 0600688 (Ukraine)-107.0 pcs., UJ 0600804 (Ukraine)-111.2 pcs., UJ 0600156 (Ukraine)-103.2 pcs. The standard (UJ 0600799)-71.0 pcs.

One of the main economic indicators that characterize the quality of seed is the weight of 1000 seeds. For three years of study by this indicator the following samples were selected: UJ 0600796 (Ukraine)-0.77 g, UJ 0600636 (Lithuania), UJ 0600439, UJ 0600804 (Ukraine)-0.78 g, UJ 0600156 (Ukraine)-0.75 г. The weight of 1000 seeds of the standard was 0.62 g.

We also measured the length of peduncle. This is an important feature that affects the manufacturability of white clover seed harvesting. The largest length of peduncle had 5 samples originating from Ukraine (UJ 0600796-44.6 cm, UJ 0600193-44.0 cm, UJ 0600804-43.6 cm, UJ 0600657-43.0 cm, UJ 0600437-41.5 cm) and also the sample originally from Sweden UJ 0600184-45.6 cm. The length of peduncle of the standard was 35.2 cm.

White clover is quite winter hardy crop. By winter hardiness, we divided the studied samples into three groups: high winter hardiness (85-98% of plants survived), medium winter hardiness (65-84% of plants survived), low winter hardiness (35-64% of plants survived). The highest winter hardiness (9 points) had samples from Lithuania UJ 0600810, UJ 06000634, UJ 0600636, the samples of local selection UJ 0600691, UJ 0600658, UJ 0600793, and two samples of wild populations UJ 0600437, UJ 0600441.

All samples of white clover, which underwent a three-year study, were resistant to powdery mildew. The most resistant by a 9-point scale (9 points-the highest resistance) were local (UJ 0600659, UJ 0600441, UJ 0600667, UJ 0600657, UJ 0600903, UJ 0600661, UJ 0600156) and foreign (UJ 0600633, UJ 0600634, UJ 0600636, UJ 0600810) samples.

## Conclusion

As a result of the study the collection samples of white clover by main economically valuable features promising samples were identified that can be used as a valuable source material for the selection of this plant by the productivity of green mass during hay way of use (7 samples), by dry matter (8 samples), by leafiness (5 samples), by plant height (9 samples), by seed productivity (5 samples), by head diameter (8 samples), by the number of seeds in the head (5 samples), by the weight of 1000 seeds (5 samples), by the length of peduncle (6 samples), by winter hardiness (8 samples), by resistance to powdery mildew (11 samples).

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