

Features of red clover selection (*Trifolium pratense L.*) within the NW of Russia

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Abstract

We have got some valuable selection materials (8 specimens). These new genotypic populations represent genotypic formulas that have been composed of forms of various geographical origin (Scandinavian countries, central and northern regions of the European part of Russia). Genotypic formulas SGP1 and G60 have bettered the standard sort of the red clover Carmine by 8.7-10.5 t ha⁻¹ in their green output capacity of the first cutting.

Key words: red clover, genotypic formulas, chlorophyll

Introduction

According to the modern conceptions, the biogeocenoses evolved simultaneously with all other changes that took place in our planet (Chernov Y.I., 2008). Along with the changes in the cenosis some local plant populations formed, and they were specific for each geographical point.

Red clover is a basis of the perennial legume feed crop within the NW region of the Nonchernozem zone of Russia. We took the concept of 'adaptive selection' which took into account the key role of meteorological and edaphic factors in the plant evolution as a basis of the red clover selection scheme which was further transformed into the biocenologic approach giving the key role to the biotic interactions.

Materials and methods

Methods used in the red clover selection: various kinds of sampling, directed refertilization, artificial hybridization, infectious background to assess initial material and selection with respect to its tolerance to the clover cancer, parity system method. We also use moderate volume of the selection materials which have been created and processed by the biotechnological methods (cell selection).

The area of the trial plot in the selection farm varies 2-14 m², the repetition is 3 – 7 times. All studies include phenologic observations, detection of plants height, foliage availability, growing activity in spring and after cutting, productivity and immunological characteristic. We cultivated the plants in the laboratory using the soil of the pots from the trial plot. We use in the selection work the methodical instructions of VIR (1985), VIK (1985). We assessed an efficiency of the plantmicrobial interactions in the studied sort specimens in the laboratory according to the methods of the ARIAM(2005). We rated content of the pigments using the spectrophotometer Spycol 11 in the biochemical laboratory SPSAU.

Results and discussion

In the first year of use (2007) the seed rejuvenescence was shown by two mixed hybrid populations of the laboratory selection: SGP1 (selected by the doubleseed factor from the

specimen of the Moscow region) and SGP2 (tolerant to the clover cancer from the Scandinavian specimen). The population TOS SGP 188-01 resulted from the mutual program of the VIK showed the highest seed rejuvenescence equal to 131.2%.

The herbage capacity (Number 5) on July of 2008 was shown by the specimens of the laboratory selection: ESI 85, DS VIK, SPG1, SPG2, I 84 and DS 8/7. Their period of growing- flowering starting was 96 days. The seed ripening took place only after expiration of 138 days.

In the competitive sort testing farm (Table 1) the best rates of the herbage capacity were shown by the specimens of the selection made by the SPE LRI for AAS: DS VIK, DS 8/7, SGP1, SGP 2 and ESI 85, representing the genotypic formulas composed of the plant forms of various ecological and geographical origin, which were selected by the factor of doubleseed availability, precocity, tolerance to the pathogens. Their period of growing- flowering was 61-74 days. Green capacity of the standard sort Carmine in the first cutting was exceeded by the green capacity of the genotypic formulas SGP1 and G60 by 8.7-10.5 t ha⁻¹. Seven formulars also had some higher seed mass (by 47-200 kg ga⁻¹ higher than the sort Carmine). At the same time, the best rates of growing-flowering periods were shown by the specimen Suid x Priek which exceeded the standard sort by 13 days.

Table 1. Ecological conditionality of evolution for the red clover plants Belogorka, 2009

Number	Description	Origin	Growing-flowering period, days	Plant capacity, number	Green mass, first cutting, t ha ⁻¹	Seed mass, kg ga ⁻¹
1	Carmine	Leningrad region	74	4.5	40.6	200
2	DS VIK	Moskow region	74	4.8	38.6	247*
3	TOS SGP(188-01)	Moscow region	74	4.2	36.5	167
4	DS 8/7	Leningrad region	74	4.8	49.3 *	273*
5	SGP1	Leningrad region	74	4.5	51.1*	267*
6	SGP2	Scandinavian countries	74	4.5	35.3	350*
7	SGP3	Leningrad region	74	4.2	34.2	287*
8	Suid x Priek	Leningrad region	61	4.2	32.2	353*
9	ESI 85	Leningrad region	65-68	4.5	39.9	400*
Average					39.7	283
<i>LCD</i> _{0.5}					5.7	19

In order to clarify an efficiency of the rhizospheric bacteriums we made some laboratoty researches.

The results got upon assessing morphological and biological factors of the red clover trial plants are stated in Table 2.

Table 2. Influence of biological preparations on morphological and biological factors of the red clover plants. Belogorka, 2009.

Sort	Biological preparation	Total content of chlorophyll a+b, Mg 100g ⁻¹ of leaves	Total content of carotene, Mg100g ⁻¹ of leaves	Number of tubercle units plant ⁻¹	Grade of affection by mildew 27.09.09
Carmine	Control	8.6	0.7	11.3	Great
	Mobilin	7.1	0.6	15.8*	Great
	Azorizin	9.7	0.8	15.3*	Average
	Agrophil	6.9	0.6	13.4	Great-Average
	Rizogreen	9.0	0.6	15.2*	Average
<i>LCD</i> _{0,5}		2.2	0.3	3.0	
Saba	Control	6.2	0.5	5.9	Great
	Mobilin	7.1	0.8*	7.9*	Minor
	Azorizin	6.4	0.5	7.4	Minor
	Agrophil	6.9	0.6	6.6	Minor
	Rizogreen	8.6*	0.5	5.8	Minor
<i>LCD</i> _{0,5}		2.1	0.2	1.8	

All biological preparations are intensively taking part in the metabolism processes and inhibit toxins of the fungi pathogens.

According to the rates of affection by mildew we have determined a certain differentiation depending on the preparation used. Appeared infection of the mildew pathogens was observed on the sixth – seventh month of the vegetation of the red clover plants. The preparation Mobilin created based on the rhizospheric bacterium *Klebsiella mobilis* actually increased the content of the carotene pigment in the leaves of the sort Saba, which is important for photosynthesis of the organic substance. In the same variant the plants showed the highest rate of white-pink tubercles on the plant roots according to the sort.

The mildew pathogens inhibit biosynthesis in the red clover leaves, while the intensive accumulation of the chlorophylla decreased. For the sort Saba it was typical in the control test. Inhibiting action of the preparation Rizogreen toward the mildew pathogens was observed along with actual exceeding of the control over total content of the chlorophyll a+b. In the pots containing the highly productive selection sort Carmine the mildew greatly affected the control plants and the plants subcultured with the preparation Mobilin and partially with the preparation Agrophil. Some positive infection proof action was showed by the preparation Azorizin and Rizogreen.

As to the content of pigments and number of tubercles on the plant roots, the high efficiency was observed upon using the preparation Azorizin.

When studying the morphological differences (sizes of germs, leafstalks and triplet leaves) depending on the used biological preparations, for the sort Saba no difference has been observed that may be explained by poor amelioration of the selection specimen as against the second sort which was cultivated based on interbreeding of the selection sorts and characterized by the homogeneous carmine coloration of the inflorescence leaves.

Conclusions

Thus, we have showed the possibility to compound perspective biogenotypic formulas from the plant specimens with the same biogeochemical regions of their origin and cultivation. We have determined a certain differentiation in reaction of the red clover sorts upon inoculating the seeds with the rhizospheric bacteriums preparations.

References

Chernov Y.I. (2008) Ecology and biogeography. –M., 2008. -580pp.