ISSN 1691-5402
ISBN 978-9984-44-071-2
Environment. Technology. Resources
Proceedings of the 8th International Scientific and Practical Conference. Volume I1

ANALYSIS OF PLANTS INCLUDED INTO LITHUANIAN RED BOOK

Jolanta Margelienė, Aušra Budrienė
Kaunas University of Applied Sciences, Faculty of Landscaping
Department of Green Plantations and Agrotechnologies
Mokslo st. 2, Mastaičiai, 53313 Kaunas reg.
E-mail: j.margeliene@kauko.lt, ausra.budriene@gmail.com

Abstract. *55 plant species included into the Lithuanian red book were chosen and analyzed. The analysis revealed that the plants of a medium height (20 species) dominate. The flowers of 17 plant species are violet, and 48 species have green leaves. After analyzing bio ecological properties of rare plants it is possible to say heliouphilous plants dominate (37 species), majority of plants flower from the beginning of June until the end of August (50 species).*
25 rare plants under research are allocated to category 2 (V) and are considered to be quickly extinct, endangered species, the population number of which and the number of individual plants decrease rapidly. The main reasons of the plant disappearance are the overgrowing of habitats by trees and bushes (58,18 %), irrigation and drainage (36,36 %) as well as intensive farming (29,09 %). The research identified that the main protective measures of rare plants are the support of the traditional farming, the limitation of hay harvesting and grazing, the maintenance of water hydro chemical , hydrological and hydrographic regime, etc.

Keywords: *biological diversity, tax, anthropogenic activity, protection of rare plants, ecology, Lithuanian Red book.*

Introduction

Lithuanian biological diversity includes about 30 thous. species of plants, mushrooms and animals. Over 2000 vascular plant species, the habitats of which are in the forests, fields, meadows, bogs, sandy places, live in the natural environment [7]. Three Red books have been published in Lithuania; they are the legal document, on the basis of which the protection of rare and disappearing plants is organized in the country. 30 endangered plant species were included in the first Red book in 1981 [2]. In 1992 the second Red book was published in Lithuania which included 210 plant species [3]. The third edition of the Red book included 339 endangered plant species in the year 2007 [4].

The year 2010 was the year of biological diversity, and encouraged everyone to take interest in plants included into the newest edition of Lithuanian Red book. First of all it is essential to get to know rare endangered plants because it determines their protection as the life of every specie is influenced by natural factors and nowadays anthropogenic activity in particular.

The third Red book includes descriptions of 3 Club mosses, 1 Horsetail, 8 Ferns, 1 Conifer, 221 Flowering plants, 1 Red algae, 1 Brown algae, 10 Charophytes, 93 Mosses. The plant species in Lithuanian Red book are divided into five categories according to the level of extinction (0 (Ex), 1 (E), 2 (V), 3 (R), 4 (I), 5 (Rs)). Endangered plants are divided the following way: 14 into zero, 79 into first, 84 into second, 99 into third, 53 into fourth and 10 into fifth category. [4]. In the book plant species are described by analyzing their status (when the specie was included into the Red book for the first time), spread (taxon areal), biology and ecology (morphological properties and bio ecology), amplitude of populations (quantitative and qualitative indicators of the country population), threats and protection (the reasons for specie population state degradation and protection measures), map (spread of taxons represented using dot method) [4].

Today because of rapid decline in biological diversity the scientific aim to describe the present biodiversity before it finally disappeared is set. It is also important to provide conditions for the biodiversity survival. For the protection of biological diversity and

sustainable resource management the convention of biological diversity was signed in Rio de Janeiro, Brazil, 1992. Every country should prepare national strategy for the preservation of biological diversity, integrated into the political tendencies of appropriate sectors. Special attention should be given to the preservation of biological diversity under natural conditions. For this purpose the system of protected territories has been created. Lithuania has also established the system of protected territories which allows to preserve biological diversity; they are reserves - 6, reserve parks – 254, national parks – 5, regional parks – 30 [1].

The main goal of EU environmental protection policy is the protection of natural habitats and wild plants. There are 15 plant species in Lithuania included into the second annex of EU habitation directives [5].

The aim: To get to know rare and endangered Lithuanian plants and to identify their extinction reasons and methods of their protection.

Materials and methods

55 plant species included into the Lithuanian Red book (2007) were chosen and analyzed using J. Vaidelys (2005) methodology presented in the publication „Methodology of phonological observations, biometric measurements and assortment formation of ornamental herbaceous plants“ [6] and the information from the publication „Lithuanian Red book“, according to the following aspects:

1. assessment of morphological and bio ecological characteristics;
2. distribution of plant species according to categories;
3. identification of plant extinction causes;
4. identification of plant protection methods.

Results

Table 1 contains the data of morphological characteristics of rare.

Table 1.

Evaluation of morphological peculiarities of plants from Red Book of Lithuania

No	Plant name	Plant height, cm	Leaf color	Blossom color
1.	*Nymphaea alba* L.	70-80	green	white
2.	*Nuphar pumium* (Timm) DC.	70-80	green	yellow
3.	*Pulsatilla patens* (L.) Mill.	35	green	violet
4.	*Corydalis cava* (L.) Schweigg. Et Korte	20-30	green	violet
5.	*Agrostemma githago* L.	50-100	grey	red
6.	*Dianthus arenarius* L.	50-100	green	yellow
7.	*Dianthus borbasii* Vandas.	30-50	green	red
8.	*Dianthus superbus* L.	30-60	green	red
9.	*Primula farinose* L.	10-20	green	violet
10.	*Viola uliginosa* Besser.	7-20	green	blue
11.	*Alyssum gmelinii* Jord.	10-20	green	yellow
12.	*Trifolium rubens* L.	20-80	green	violet
13.	*Lathyrus laevigatus* (Waldst. Et Kit.) Gren.	20-60	green	yellow, red
14.	*Astrantia major* L.	50-80	green	yellow
15.	*Eryngium maritimum* L.	20-60	grey	yellow
16.	*Scabiosa columbaria* L.	40-80	green	violet
17.	*Succisella inflexa* (Kluk) Beck.	50	green	violet
18.	*Centaurium littorale* (Turner ex Sm.) Gilmour	3-15	green	red
19.	*Gentiana pneumonanthe* L.	25-60	green	blue
20.	*Gentianella amarella* (L.) Borner	15-40	green, brown	blue
21.	*Nymphoides peltata* (S. G. Gimel.) Kuntze	200	variegated	blue
22.	*Polemonium caeruleum* L.	35-120	green	blue

No	Plant name	Plant height, cm	Leaf color	Blossom color
23.	*Pulmonaria angustifolia* L.	20-30	green	blue
24.	*Linaria loeselii* Schweigg.	10-40	green	yellow
25.	*Pedicularis sceptrum-carolinum* L.	30-80	green	yellow, red
26.	*Ajuga pyramidalis* L.	20-30	green	violet
27.	*Scutellaria hastifolia* L.	10-40	green	blue
28.	*Dracocephalum ruyschiana* L.	40-60	green	blue
29.	*Prunella grandiflora* (L.) Scholler	10-60	green	violet
30.	*Salvia pratensis* L.	20-80	green	Violet, blue
31.	*Campanula bononiensis* L.	60-81	green	violet, blue
32.	*Lobelia dortmanna* L.	40-80	green	blue
33.	*Centaurea phrygia* L.	60-81	green	violet
34.	*Tragopogon Gorskianus Rchb*. f.	40-60	green	yellow
35.	*Aster tripolium* L.	40-60	green	violet
36.	*Alisma lanceolatum* With.	100	green	white
37.	*Iris sibirica* L.	30-80	green	Violet, blue
38.	*Gladiolus imbricatus* L.	40-60	green	red
39.	*Allium vineale* L.	60-80	green	violet
40.	*Gagea pratensis* (Pers.) Dumort.	10-20	green	yellow
41.	*Allium angulosum* L.	15-40	green	white, yellow
42.	*Allium ursinum* L.	20-40	green	white
43.	*Cypripedium calceolus* L.	50	green	yellow, violet
44.	*Cephalanthera logifolia* (L.) Fritsch	20-30	green	white
45.	*Gymnadenia conopsea* (L.) R. Br.	30-60	green	violet
46.	*Coeloglossum viride* (L.) Hartm.	20-30	striped	yellow
47.	*Ophrys insectifera* L.	20-60	green	yellow with dark edging
48.	*Orchis mascula* (L.) L.	50-80	green	violet
49.	*Orchis militaris* L.	10-20	green	violet
50.	*Dactylorhiza incarnate* (L.) Soo	60-80	variegated	violet
51.	*Dactylorhiza ochroleuca* (Wustnei ex Boll) Holub	60-80	green	white, yellow
52.	*Liparis loeselii* (L.) Rich.	15-20	green	yellow
53.	*Bolboschoenus maritimus* (L.) Palla	10-30	green	dark brown
54.	*Eriophorum gracile* W. D. J. Koch ex Roth	15-25	green	white
55.	*Hammarbya paludosa* (L.) Kuntze	10-20	green	white

The height of the researched plants is given in picture 1 .

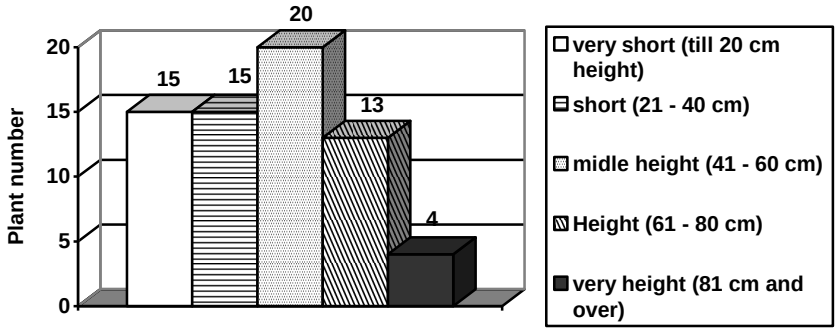

Fig. 1. **Plant height**

From the data presented (picture 1) it is obvious that the plants of a middle height dominate - 20 plants: *Dianthus borbasii*, *Aster tripolium*, *Dianthus superbus*, *Tragopogon Gorskianus*, *Scabiosa columbaria* etc. There are 15 short plants: *Allium angulosum*, Gentianella amarella, *Allium ursinum*, *Linaria loeselii*, *Scutellaria hastifolia* etc. There are 15 very short plants: *Liparis loeselii*, *Hammarbya paludosa*, *Alyssum gmelinii*, *Orchis militaris* etc.

The flower color of the plants is presented in picture 2.

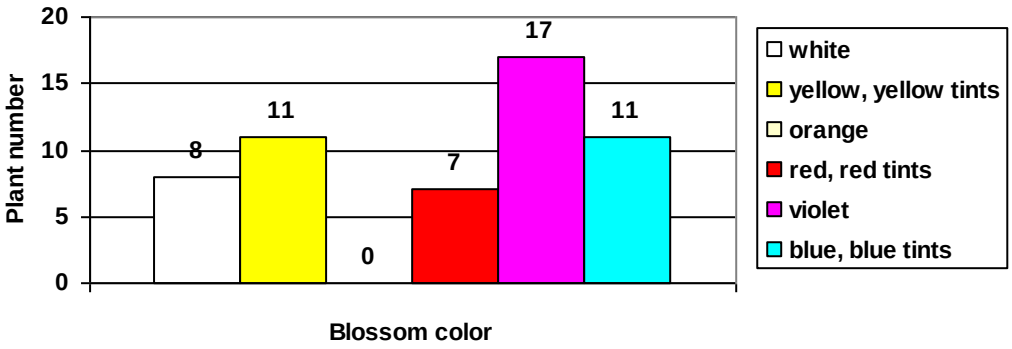

Fig. 2. **Plant blossom color**

Diagram (picture 2) shows that the prevailing color of the endangered plants, included into Lithuanian Red book, is violet - 17 plants. (*Linaria loeselii*, *Centaurea Phrygia*, *Succisella inflexa*, *Allium vinele*, *Pulsatilla patens* etc). 11 plants have yellow blossoms: *Liparis loeselii*, *Cypripedium calceolus*, *Nuphar pumium* etc.
The range of plant leaf color is given in picture 3. It is natural that the green leaf color dominates among the plants (48 plants).

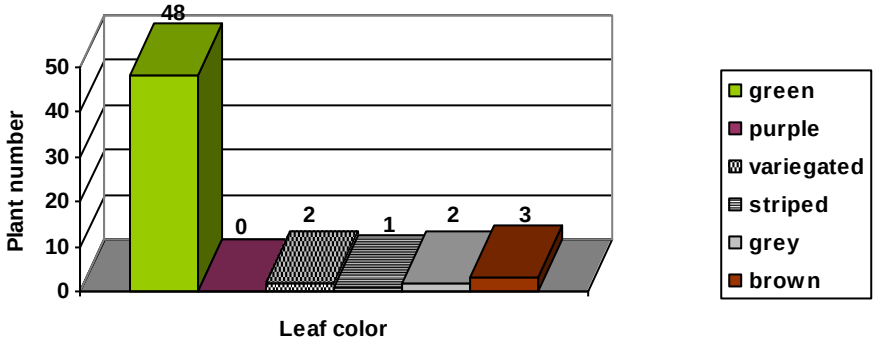

Fig. 3. **Plant leaf color**

The need for light of the plants is presented in picture 4.

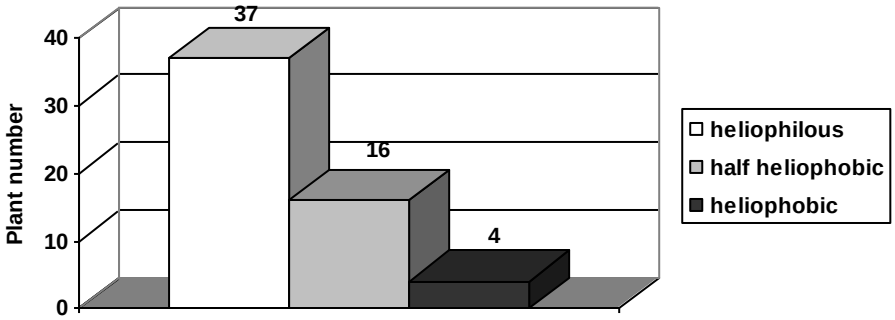

Fig. 4. **Plant lightening**

Picture 4 shows that majority of plants are heliouphilous (37 plants.): *Dactylorhiza ochroleuca*, *Prunella grandiflora*, *Nymphoides peltata*, *Centaurium littorale* etc. There are

fewer plants that grow in a shade (16 plants.): *Hammarbya paludosa*, *Coeloglossum viride*, *Allium ursinum*, *Corydalis cava* etc.
Evaluation of plant blooming time is given in picture 5.

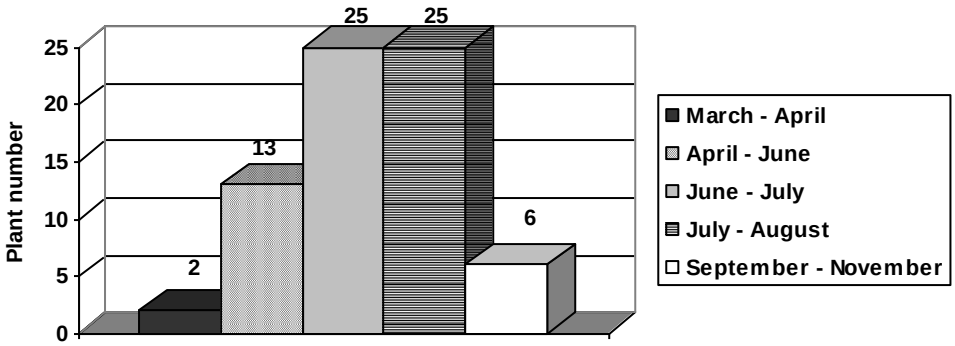

Fig. 5. **Plant blooming time**

In Lithuania endangered plants most often bloom from June till August (50 plants): *Ophrys insectifera*, *Scutellaria hastifolia*, *Nymphaea alba*, *Dianthus arenarius* etc. There are fewer plants that bloom from April till June (13 plants): *Coeloglossum viride*, Iris *sibirica*, *Pulmonaria angustifolia* etc.
The analysis revealed that 25 plants are allocated to category 2 (V) and are quickly becoming extinct, endangered species, the number of populations and individual plants of which is decreasing rapidly.
The majority of rare plants become extinct because of overgrowing of habitats by trees and bushes (58,18 %), irrigation and drainage (36,36 %) as well as intensive farming (29,09 %). The less threat is caused by grazing (21,82 %), plant picking for medicine and plant cutting (20 %) and grass stab (16,36 %).
The main protective measures of rare plants are the following:

1. The support of the traditional farming, the limitation of hay harvesting and grazing.
2. The maintenance of water hydro chemical, hydrological and hydrographic regime.
3. The maintenance of open areas, their protection from overgrowing.
4. Limitation of farming and recreational activity.
5. Limitation of clean forest fellings.
6. Artificial restoration of species.

Conclusions

After assessing morphological properties of 55 endangered plant species it was identified that the plants of a middle height dominate (20 species), even 17 plant species have violet blossoms; and green color leaves characteristic to 48 plant species. After researching the bio ecological properties of rare plants it is possible to say that the heliouphilous plants prevail (37 species) that bloom from the beginning of June till the end of August (50 species).
The analysis of rare plants showed that the majority of researched endangered plants belong to the 2 (V) category and are fast disappearing endangered species the number of populations and individual plants of which is decreasing rapidly.
The main reasons of the plant disappearance are the overgrowing of habitats by trees and bushes (58,18 %), irrigation and drainage (36,36 %) as well as intensive farming (29,09 %). The research identified that the main protective measures of rare plants are the support of the traditional farming, the limitation of hay harvesting and grazing, the maintenance of water hydro chemical, hydrological and hydrographic regime, etc.

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