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**USAGE OF SCIENTIFIC ELABORATIONS PERFORMED BY
THE LECTURERS DURING THE EDUCATIONAL PROCESS
ON THE PATTERNS OF PHYTOPATHOLOGY AS AN
EDUCATIONAL DISCIPLINE**

s. 101-108

ABSTRACT

The experience of teaching Phytopathology as an educational discipline is being examined in this article. This article shows how a separate topic (theme) can be used in the educational process for intensive learning and better mastering the subject; for assistance in solving specialized and practical problems of professional activity in the sphere of growing decorative plants, creating and exploiting the objects of the park-garden management; in teaching of growing the planting material of decorative plants both in the open air (nurseries) and greenhouses. Varieties of encouraging and stimulating the interest to mastering the subject have been exposed.

KEYWORDS

phytopathology, park-garden management, recipients, agrochemicals and pesticides, methodical recommendations, Petri-dish, preventative sprinkling, mycelium of funguses, damping-off, seedlings, Scotch pine seedlings, germination, mycological and statistical methods, saprotrophical and parasitical types, mortality from the disease, toxic substances, greenhouse, educational disciplines (subjects).

INTRODUCTION

The practical orientation of the process of training future professionals is one of the necessary conditions for the effective operation of universities [1, 2]. The qualification level of university graduates will affect the efficiency of enterprises, organizations, and institutions in which they will work [3]. In the process of preparing highly qualified specialists of the garden-park management some scientific work is fulfilled (performed) by every lecturer in the accordance with the subject matter of the department. It gives the opportunity to keep the knowledge of the subject up to standards, to have a command of the information concerning new achievements in this sphere, to conduct the information to the recipients in the interesting and exhaustive manner.

One of the main educational disciplines is Phytopathology. While studying this discipline the recipients achieve the abilities to detect diseases of the forest and park plantation on the basis of symptoms; to know the character of pathological processes and to response to them in time.

According to the curriculum of holders of bachelor's degree, studying such educational discipline as Phytopathology is performed by the recipients in the third course, VI semester.

In accordance with the curriculum such forms of work as reading, lectures, practical trainings, educational practice, modular control (monitoring) (2 modulars), independent work of the recipients are planned. The form of the final control is an examination.

The requirements which are put on the lecturers are:

- to stimulate timely fulfillment of the tasks,
- to motivate the activity of the recipients,
- to ensure the effective team work.

A specific character of this educational discipline lies in a considerable number of Latin terms and difficulties in perception of some themes:

systematic position,
ways of reproduction of funguses,
bacteria,
viruses,
actinomycetes and others.

To make learning (mastering) easier it is necessary to combine theory and practice. Here we give an example of such combination while studying the infectious disease - Scotch pine seedlings damping-off.

The object of the research: planting material of the Scotch pine with the signs of the infectious damping-off lesion.

The research aim:

- to show the possibility of acquiring (mastering) theoretic knowledge through practical work and independent experiments of the recipients. This publication gives an example how by means of an object (Scotch pine or fir tree seedlings with the signs of damping-off:
- to learn more thoroughly such questions as the diagnoses of the disease, agricultural technology of growing the planting material, calculation and determination of the lesion degree, methods of planting material protection and so on;
- to teach the recipients to organize effective and safe work conditions;
- to plan effectively the time for achieving the necessary results;
- to organize measures for growing the planting material of decorative plants both in the open air and in the greenhouses and to take care of it.

Methods of the research: mastering the knowledge by the recipients: observation, control, experimental methods including both mycological and statistical ones.

Participants of the research: recipients of the two third course groups (first bachelor's degree).

DISCUSSION

Fusarios or infectional damping-off is the most harmful disease of Scotch pine seedlings (*Pinus sylvestris* L.) at the early age. The agents of this disease are the fungi of Dothideomycetes (*Alternaria* sp.), Sordariomycetes (*Fusarium* spp.), Leotiomyces (*Botrytis* spp.), type as well as of Oomycetes – *Globisporangium debaryanum* (R. Hesse) Uzuhashi, Tojo & Kakish type. The name of the disease was consolidated after the main agent – fungi of *Fusarium* type [4; 5; 6].

As a result of Scotch seedlings lesion with agents of infectional damping-off the germination is greatly descended, blank space or damping-off sites are observed.

In spite of more than 120-year-old history of studying this disease the problem of preventative and protective measures has not lost its topicality. The agents of this disease are being met everywhere which has been indicated in many scientific works.

This disease is being met both in less developed countries and highly developed ones, such as the United Kingdom, Finland where the process of growing planting material is conducted on a high material and technical level.

Wide spreading of the disease is explained by the biological peculiarities of fungi (agents of the disease) and the mistakes which have been made when the planting material was being grown.

There are many other reasons of wide expansion of the disease:

- different types of feeding among the agents of the disease (saprotrophical and parasitical types);
- a great number of spores and as a result the possibility to lesion the plants quickly;
- the possibility to adopt to the action of pesticides;
- the ability to make up the forms which are resistant to unfavourable environmental conditions.

Chlamydospores of the fungi may keep their ability for germinating for a long time under the temperature from -35-40 °C, to +40 °C which is extreme for many kinds [7]. Evolution of fungi starts in spring when the soil is wet enough and its temperature is not less than +5-8 °C. At the moment of germination the mycelium of the agent fungi develops and spreads quickly, lesions the young plants and causes their mortality.

Such conditions are especially favourable for disease spreading:

- rainy and cool weather in May- June;
- very deep sowing or digging in;
- formation of the crust on the surface of the soil;
- usage of compost made of decaying remains;
- too thick sowing.

Mortality of the shoots is caused by the influence of the toxic substances which have been formed by the pathogen fungi and they cork the transmitting system of the plants.

Mycelium of the disease agents spreads with the speed of 4-5 cm per 24 hours. Very often this disease reaches the size of epiphytoty in the greenhouse complexes. The disease has two stages: pre-sprout and post-sprout. During the pre-sprout stage blank space within the sowing rows appears. During the digging up one can see the dead seeds. During the post-sprout stage visually healthy shoots suddenly damp off. It is from here the second name of the disease comes – inflectional seedling damp-off.

The source of the infection is the fungi living in the soil, on the plant remains and on the surface of the seeds. In the case when the infection accumulates in the soil during the seed growing the fungi transit to parasitical way of feeding.

During mastering the educational discipline Phytopathology the problem of planting material lesion with inflectional damping-off agents is examined both in the course of lectures and during the practical trainings. At the beginning of mastering the discipline in the course of lectures the recipients are acquainted with inflectional and non-inflectional diseases and their outer signs.

Scotch pine seedlings as well as those of other woody species lesioned with damping-off agents are vivid and available exhibits for the use of visual aids and better memorizing the theme. Practical trainings are an indivisible part of the acquired knowledge above:

- the types of plant diseases;
- morphological peculiarities and systematization of the pathogenic organisms;
- the character of pathological processes;
- timely reaction on them;

Fulfilling the tasks of the practice the recipients acquire new skills in finding the diseases and their lesion symptoms in the forest and park plantations.

Practical work is done during studying the pathological symptoms on living and fixed objects. The objects for every practical training are chosen taking into account not only presence of the living, fixed or herbarium material but also the expansion of the disease.

The practical trainings are followed with drawing the general sight, form and structure of the examined objects with their further description. During the practice the recipients work out every theme in accordance with methodical recommendations.

Inflectional Scotch pine damping-off is examined in the process of fulfilling the practical trainings aimed at learning the diseases of fetuses and seeds (their pre-sprout stage) and the diseases of shoots and seedlings (their post-sprout stage).

During learning diseases of fetuses and seeds the recipients are proposed to put the seeds of the woody species with quick growing ability into the so-called Petri-dish or double-dish. Usually, the Scotch pine or fir tree seeds come up within two weeks. The recipients put 100 seeds of the Scotch pine or fir tree on the wet filter paper in the Petri-dish and examine their germination (growing). By no means there will be a part of the seeds lesioned with the agents of mould in it. Its number/part can be calculated according to the formula:

$$P = \frac{n \times 100}{N}, \quad [7],$$

where P – is the number of the lesioned seeds;
n – is the number of the seeds with the signs of moulding or where mycelium of the fungus is visible;
N – the total number of the seeds in the Petri-dish.

While studying the diseases of shoots and seedlings characteristic signs (features) of damping-off can be demonstrated to the recipients by pulling the lesioned seedlings out of the soil – their axial cylinder roots are bare.

Depending on the weather conditions the seedlings for experiments are sown either in plastic ditches or in the soil; they also can be shown in nurseries, if possible. The recipients are also acquainted with the methods of calculating the part (number) of the lesioned plants according to the formula given above.

If the quantity of the lesioned seedlings varies from 5 to 33 % – it is a low degree. If it varies from 33 to 66 % – it is a medium degree (level). If the portion of the lesioned seedlings is higher – it is a high level (degree) of damage.

Consolidation of the knowledge acquired during the summer practice is also foreseen by the curriculum. Different excursions to forestry enterprises and corresponding laboratories of scientific institutions existing in the city, are organized.

The territory for practical training is also divided by the lecturer into the equivalent plots and the recipients monitor the plots which have been assigned to them. Then the collection of the patterns with the signs of lesion or damage is gathered. The collected patterns are sorted. The plant material with the sign of inflectional lesion is put (laid) into a wet camera to define the pathogen in 3-5 days.

During the preparation of the research (diploma) work or during the club activity while studying the protective measures, vegetation experiment with different methods of seedling processing can be laid as well. The chemical method dominates now in the system of protective measures connected with prevention and limitation of the disease spreading. The reason is that it possesses higher effectivity, simplicity in processing and longer period of its protective action in comparison with biological preparations. To avoid the negative influence on the recipients' health during the practice the effectivity of such available biological preparations as Gaupsin, Planriz, Trihodermin BL and Phitosporin M and others can be explored. The pre-sowing seed processing of Scotch pines or other species of trees is made for that. It includes floating and soaking within the biopreparations.

After floating the seeds of good quality sink on the bottom of the container while the empty or the seeds of poor quality go up. In such a way the seeds are sorted. The water is poured out, the seeds that have sunk are dried out till the free-flowing condition (quicksand).

Depending on the class of germinating capacity weightings are made in accordance with the norm of sowing. Then the seeds are soaked in the solution of the biopreparation, dried out again and sown in the soil at a depth of one cm. The seeds which have been soaked in the water serve as a standard.

For receiving reliable data 4-5 recurrences of each variant are taken. Looking after the seedlings includes regular watering, preventative and destructive sprinkling with the solutions of biopreparations, removal of the seedlings lesioned with damping-off. Preventative sprinkling by means of biopreparations is performed in the open air or greenhouses after the harmonious germination. For the seeds of the Scotch pines or fir-trees it usually happens on the 25-th day after sowing.

The recipients carry out their observation over the shoots, damping-off mortality and survival till the moment when the trunks become woody and the danger of lesion with pathogenic agents disappears. It is about 2.5 months from the moment of sowing the seeds. Calculating the results, the recipients learn to estimate, interpret, synthesize the data they have achieved, improve their skills of possessing the programs of statistical processing the results of their own research.

CONCLUSIONS

Summing up it should be mentioned that such form of mastering will make it possible to prepare the future specialists in the branch of garden park management more qualitatively, since different factors (abiotic and biotic) declining the decorative state of plants appear both in the process of creating and exploiting the landscape objects. Connection of theory and practice promotes the development of recipients' ability to solve complicated both specialized and practical problems of the professional activity in the field of growing decorative plants, designing, creating, and exploiting the objects of the garden-park management.

It teaches to grow the planting material of the decorative plants both in the open air and in the greenhouses.

It forms the skills for safe usage of agrochemicals and pesticides considering their chemical and physical qualities as well as their environmental damage (ingury).

It also promotes using the knowledge in other practical situations connected with safe activity.

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WYKORZYSTANIE OPRACOWAŃ NAUKOWYCH WYKONYWANYCH PRZEZ WYKŁADOWCÓW W PROCESIE KSZTAŁCENIA NA WZORACH FITOPATOLOGII JAKO DYSCIPLINY EDUKACYJNEJ

STRESZCZENIE

W artykule omawiane są doświadczenia nauczania Fitopatologii, jako dyscypliny edukacyjnej. Artykuł ten pokazuje, jak osobny temat można wykorzystać w procesie edukacyjnym do intensywnego uczenia się i lepszego opanowania przedmiotu. Może stanowić pomoc w rozwiązywaniu specjalistycznych i praktycznych problemów działalności zawodowej w zakresie uprawy roślin ozdobnych, tworzenia i eksploatacji obiektów gospodarki parkowo-ogrodowej, a także nauczaniu uprawy materiału do sadzenia roślin ozdobnych, zarówno na wolnym powietrzu (szkółki), jak i w szklarniach. Wyeksponowane zostały odmiany, zachęcające do opanowania tematu i pobudzające zainteresowania.

SŁOWA KLUCZOWE

fitopatologia, gospodarka parkowa, biorcy, agrochemikalia i pestycydy, zalecenia metodyczne, szalka Petriego, deszczowanie prewencyjne, grzybnia grzybów, zgorzelina, sadzonki, sadzonki sosny zwyczajnej, kiełkowanie, metody mikologiczne i statystyczne, saprotroficzne i pasożytnicze rodzaje, śmiertelność z powodu choroby, substancje toksyczne, szklarnia, dyscypliny edukacyjne (przedmioty).



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