Class 15

Evaluation of the magnitude of stocks of medicinal raw materials on specific thickets and by the method of key sites.

OBJECTIVE OF THE LESSON:

1. to get acquainted with the basic concepts, goals and objectives of resource science of medicinal plants.
2. to master the methods of planning and organisation of research to determine the reserves of medicinal plant raw materials.
3. Acquire skills in determining the biological and operational reserves of wild medicinal plants.
4. Learn to make a reasonable choice of methodology for determining the reserves of medicinal plants.

QUESTIONS:

1. Yield. Methods of determining yield. Problem solving.
2. The concept of biological and operational stock of raw materials.
3. The volume of possible annual harvesting of raw materials.

Informational material

Medicinal plants occupy an important place among the diversity of human uses of plants. As society's demand for medicinal plant raw materials increases, the problem of rational use of natural resources of medicinal plants becomes relevant. Under the resources of medicinal plants is understood a set of objects of plant origin (including fungi), which are used or can be used in medical practice.

Resource science of medicinal plants is a section of botany and pharmacognosy, devoted to the study of reserves of wild species, their location, the organisation of harvesting, their profitability and protection of medicinal plants.

The main tasks of resource science of medicinal plants include the following:

1. Quantitative assessment of medicinal plant reserves for each region, including the identification of large commercial arrays of widespread species, as well as rare species and species that have become rare as a result of harvesting.

2. Determination of volumes of possible annual harvesting, planning of nomenclature of medicinal plants both for separate districts and for the country as a whole. 3.

3. Determination of the order of exploitation of thickets for conservation, normal renewal of natural resources and rational location of harvesting sites.

4. Conducting chemical taxation to identify populations with the highest content of active substances.

5. Study of the rate of recovery of medicinal plant thickets after harvesting, the influence of anthropogenic and geographical factors on the quality of raw materials, as well as the identification of ecologically pure thickets of medicinal plants in industrialised regions.

6. Development of recommendations for the rational use and protection of rare species of medicinal plants.

Determination of yield (raw material stocking density).

In practice, three methods are used to determine yields: the plot method, the model specimen method and the projective cover method.

The choice of method is primarily related to the life form and habitus and the part used as raw material. For small herbaceous plants and shrubs in which the above-ground organs are used as raw material, it is more rational to determine yields on survey plots. This method is the most accurate, as no additional recalculations are made, reducing the accuracy of the study. However, this method is too labour-intensive when estimating the yields of underground organs or when working with large plants that require the establishment of large survey plots. In these cases, the method of model specimens is preferred. For low-growing herbaceous and shrubby plants, especially when they form dense turfgrasses, the method of estimating yields based on projective cover is recommended.

Determination of yields at survey sites.

A series of survey plots is laid out, the size of which is determined by the size of adult specimens. The optimal size of a plot is considered to be at least 5 adult specimens of the plants under study. Plots can be square, round or rectangular in shape.

After the establishment of counting plots, all raw phytomass is collected at each of them in accordance with the requirements of the ND for a particular type of raw material and recommendations for collection and drying of this species. Of course, sprouts, juvenile (young) or damaged plant specimens are not subject to collection.

The raw material is immediately weighed to an accuracy of 5 per cent (collected from each site separately). Once the weight has been calculated, it is immediately clear whether a sufficient number of counting sites have been established. Thus, if the minimum and maximum values at 15 plots differ no more than 5-7 times, it is possible to limit the number of plots to this number. If the difference is 15-20 times, another 15-20 sites should be laid. From the raw material collected from the survey plots during yield determination, samples can be taken for chemical taxation of thickets. The yield of the species in the given thicket is then calculated.Подсчитывают среднюю арифметическую урожайности (M) и ошибку средней арифметической (m), по следующим формулам:

$$M = \frac{\Sigma(V)}{n}$$

где V – mass of the raw material,

n – number of sites

$$C = \Sigma(V)^2 - \frac{(\Sigma V)^2}{n}$$

C – variance

$$\sigma = \frac{\sqrt{C}}{n-1}$$

σ – standard deviation

$$m = \frac{\sigma}{\sqrt{n}}$$

The yield is equal toM±m.

Determination of yield from model specimens.

In estimating yield using this method, two indicators are established: the mass of raw material obtained from a model specimen and the number of marketable specimens (shoots) per unit area.

Individual specimens are used when the plants are relatively small and the "boundaries" of the specimens are easy to establish. In cases where collecting raw material from a whole specimen is labour-intensive (trees, large shrubs) or its boundaries are difficult to determine, it is preferable to use shoots as the counting unit.

Counting the number of specimens (shoots) is carried out on counting plots ranging in size from 0.25 to 10 m2.

The size of the plots is determined by the size of the species under study, and their number by the density of the thicket and even distribution of the species over the area. For the dominant species in the herbage, if they are relatively evenly distributed, it is usually sufficient to establish 15-20 plots; if they are less abundant and unevenly distributed, the number of plots increases to 30-50.

The number of specimens and their raw phytomass is estimated to an accuracy of 10%. If the number of specimens is small (less than 1 specimen per 1m2 on average), it is best to calculate the number of specimens on route walks. It is possible to use the same route tracks as for determining the area of the thicket, but they should be divided into sections of 20, 50 or 100 steps depending on the size of the thicket and its density (the larger the thicket and the rarer the species, the larger the sections should be).

The number of marketable specimens is counted on a 1m or 2m wide strip. To obtain reliable averages, counts should be made on 25-40 sections of the route.

To determine the raw mass, model specimens (shoots) are selected at the counting sites or along the route, and all marketable specimens are taken without subjective selection of "typical" ones. The most objective is systematic selection, when every second, fifth or tenth specimen encountered along the route is taken as a model.

Each model specimen is weighed for its raw organs and then the mean (M±m) is calculated.

Weighing all specimens together and then calculating the mean by dividing the total mass by the number of specimens is not acceptable, as this method precludes statistical evaluation of the data obtained.

Yield is calculated by multiplying the average number of specimens by the average raw weight of one model specimen.

The yield M3 and the error determined by the model specimen method are calculated using the following formulae:

$M_3=M_1 \cdot M_2$

$$m_3=\sqrt{(M_1 \cdot m_2)^2+(M_2 \cdot m_1)^2}$$

Determination of yield by projective cover.

When determining the yield by this method, the average projective cover of a species within a thicket and the yield of raw material mass from 1% of projective cover are determined - the so-called "price" of 1% of projective cover.

Projective coverage is determined in resource studies by different methods: by eye, Ramensky grid, square-grid, etc.

To determine the "price" of 1% coverage on each site cut and weigh raw material from 1 dm2 and thus determine the "price" (M±m) of 1% coverage. It should be remembered that this value will be different in different plant communities and under different ecological conditions, so when working with this method, the "price" of 1% projective cover should be determined in each surveyed thicket. Yield is calculated as the product of the average projective cover (M±m) by the price of 1% (M1±m1) using the same formulae as for model specimens.

Calculation of stocking rates on specific thickets

Based on the data obtained on the area of the thicket and its yield, the stocking rate of a particular thicket is calculated. The biological stock is calculated using the upper yield limit (M+2m), but this value has little practical value. The calculation of the value of the exploitable stock is based on the lower limit (M-2m).

Ebiol.=S·(M+2m)

Eexpl.=S·(M-2m)

Calculation of the value of possible annual blanks.

The exploitation stock indicates how much raw material can be harvested when the bush is used once. However, annual harvesting in the same stand is only possible when fruits are used, and then only in those plants that reproduce mainly vegetatively. In all other cases, it is necessary to calculate the volume of possible annual harvests. For this purpose, it is necessary to know how many years it takes for the plant to recover its original parameters after harvesting. For inflorescences and above-ground organs of annuals - every 2 years, for perennials - every 4-6 years, and for underground organs - every 15-20 years.

The billet turnover is calculated according to the formula:

a = overgrowth recovery time + 1

Amount of possible annual harvesting:

$$V_{pos} = \frac{E_{expl}}{a}$$