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**PREDICTION OF STAND DAMAGE INTENSITY BY WINTER MOTH
IN THE LEFT-BANK FOREST-STEPPE**

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Introduction. The base for prediction of the consequences of injurious effect of foliage browsing insects is the evaluation of relations between population density and crown damage. Such index is called critical population density and is calculated by dividing foliage phytomass by feed rate.

Classic prognostic tables, which were prepared by A. Illinsky for the stands of 50 years old and are used in forest protection, do not take into account regional peculiarities of foliage mass and previous tree condition. Now foliage phytomass of the main forest trees is well studied for different natural zones (Lakyda et al., 2010). Therefore it is possible to calculate the critical population density of different foliage browsing insects in different regions.

The aim of this research was the evaluation of winter moth (*Operophtera brumata* L.) critical population density form prediction the severity of oak stands damage by caterpillars in the Left-Bank Forest Steppe of Ukraine.

Material and methods. Population indices of winter moth were determined by own investigations and publications.

Critical density of the 1st instar larvae of winter moth per one tree, which causes 100% defoliation, was calculated using the data on feed rate for one caterpillar for the whole time of its development and foliage phytomass of oak (*Quercus robur* L.) in artificial stands of known diameter and height. To evaluate critical population density respective phytomass was divided by feed rate.

It was assumed, that foliage phytomass of weakened tree (the IInd category of sanitary condition) is 0.8 of phytomass of the healthy tree (the Ist category of sanitary condition). Phytomass of severely weakened tree (the IIIrd category of sanitary condition) and drying tree (the IV category of sanitary condition) is 0.4 and 0.16 of phytomass of the healthy tree.

Intensity of crown damage by winter moth larvae was calculated using the data on critical and real population density (larvae/tree).

Results. It is known, that winter moth prefers oak stands of 40–80 years old. Therefore, examples of tables of critical population density of winter moth are presented for trees with diameter 10–36 cm and height 10–28 m. Examples of calculation for healthy and drying trees are presented.

If it is known, how many larvae can cause 100 % defoliation, it is possible to calculate the number of larvae which cause 10, 20, 30 ... 90 % defoliation. The examples are presented for the trees with diameter 20 cm and height 20 m, and obtained data are rounded to integers. It was shown, that depending on initial

sanitary condition of trees, their total damage can be caused by 13125 to 2100 larvae of winter moth.

The procedure of prediction of crown damage by winter moth for year $n+1$ by data of critical and actual population density (caterpillars per tree) is described.

At least 100 trees must be inspected the year n for category of sanitary condition. Critical density of larvae must be taken from the table for trees with respective sanitary condition, mean diameter and height.

Population density of winter moth must be assessed.

If eggs are assessed, their number per branch must be multiplied by number of branches per tree. If the data on egg vitality are absent, it must be assumed 75 %.

If moths are assessed in the trap belts, the fecundity of females and mean egg number per tree is assessed and multiplied by egg vitality.

The example. Average 50 females of winter moth were assessed per one tree, female fecundity is 150 eggs. Then there is $30 \times 150 \times 0.75 = 3375$ the 1st instar larvae per tree.

Taking into account mean diameter, height and category of sanitary condition of the tree, one must take the meaning of critical larvae density from the table and compare with assessed larvae density.

For example, critical larvae density is 13100 larvae per tree of the 1st category of sanitary condition with diameter 20 cm and height 20 m, and assessed density is 3375 larvae per tree. Then the severity of crown damage is $3375 \times 100 / 13100 = 25.8$ %.

If the tree of the same size is drying, than the severity of crown damage is $3375 \times 100 / 2100 = 160.7$ %.

It means that at the same winter moth population density, healthy trees would be damaged insignificantly, and drying trees would be all-over damaged.

Conclusions. The tables for prediction of winter moth critical population density of certain diameter and height have been calculated using oak foliage phytomass tables, sanitary condition of trees and feed rate of larvae.

Expected intensity of foliage damage by larvae must be calculated by comparing the table larvae density and larvae density, which is determined from assessed number of eggs or females per tree.

Winter moth (*Operophtera brumata* L.), critical population density, foliage phytomass, sanitary condition of trees, feed rate.