

ЕКОЛОГИЯ

Екологични и метеорологични проблеми на големите градове и индустриални зони

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UTILIZATION OF WOOD WASTE BY VERMICULTIVATION METHOD

The questions of wood waste utilization by the biotechnological vermicultivation method are considered. The composition of the nutrient medium for red Californian hybrids is substantiated. It was established that inclusion in the substrate of *Sambucus nigra* wood (15%) does not reduce its quality. A way of utilization the remnants of tree trunks is proposed.

Key words: remnants of tree trunks, utilization, vermicultivation, ecologically safe organic fertilizer, red Californian hybrid, biohumus.

Introduction

Breeding worms (red Californian hybrids), "vermicultivation" – one of the perspective ways of organic waste utilization. These hybrids allow to convert various kinds of organic waste into valuable humus fertilizers. This is happening with the help of environmentally friendly methods in short terms.

Feed for worms is a various organic wastes with high cellulose content. These wastes have passed the fermentation process. The basis of the diet for worms is dung biomass. A certain amount of other organic waste is added to biomass.

The vermicultivation method provides the opportunity to transform the various wastes. These wastes were previously the main pollutants of the environment. On the one hand, there is a transformation into a complete protein of animal origin. It is suitable for use in feeding animals and, in some countries, even in human nutrition (worm biomass). And on the other hand, there is a transformation into a granular humus fertilizer (biohumus). The waste is recycled to the compost using worms. This is a cellulose and paper industry waste that is difficult to utilize [1–3, 7].

At the present stage, vermiculture biotechnology requires the following steps:

- preparation of a nutrient medium (substrate);
- an analysis of its suitability for use;
- formation of areas for California colonies, their feeding and care;
- separation of lodges;
- receipt of finished products – worm biomass and biohumus [1–3].

Task definition

For today the issues of wood waste utilization are very topical. This is especially true of the remnants of tree trunks. They are decomposed and potentially dangerous for the ecosystem (Fig. 1, 2).



Figure 1. The trunk of decomposed tree (*Sambucus nigra*) (Version 1).



Figure 2. The trunk of decomposed tree (*Sambucus nigra*) (Version 2).

Forestry protection methods include a number of techniques that have prophylactic significance. They reduce the possibility of forest damage by pest and disease during the entire period of forest cultivation [6].

On the other hand – in dead wood of forest arrays one third of forest biodiversity lives. Such wood is an indicator of the forest [4, 5]. One hectare of forest can contain from 100 to 200 m³ of dead wood. According to the sanitary rules in the forests of Ukraine it is allowed to keep it only up to 5 m³/ha.

So, there are questions about utilization of remainder.

We offer technology that is the processing of organic waste by the Californian hybrid. During this process, high-quality ecologically safe fertilizer biohumus is obtained [1, 7].

.Results

As a substrate, we used chicken excrement, feed chalk, plant waste and food waste (control group). In the experimental group, we replaced 15% of this substrate the *Sambucus nigra* wood.

It was necessary to study the adaptation process of the California hybrid population to the wood substrate. 30 days after the placing of the basic feed (control and experiment) we conducted a test using 50 worms. [1, 2]. The nature of this test was as follows: in two wooden boxes of 60x40x15 cm with drainage holes, the test substrates and 50 worms were placed. They were held at 19–23°C for 48 hours, then they were chosen, counted the number and determined their condition (Table 1).

Table 1

Suitability test of substrates for vermiculture

Indexes	Substrate			
	Standard substrate		Substrate with wood waste	
Live worms	48	96%	46	92%
Active	43	86%	40	80%
Inactive	5	10%	6	12%
Dead	2	4%	4	8%

It was found that the substrate with the addition of *Sambucus nigra* wood wastes (15%) is not harmful to the body of red Californian hybrids (Table 1). The number of live worms adapted to the standard substrate was 96% (48 individuals); and the number of live worms adapted to the experimental standard substrate is 92% (46 individuals).

Most Californian hybrid individuals are active and normally mobile. This confirms the feed suitability for vermiculture and worm adaptation to a new substrate.

The results of the growth, development and reproduction studies of Californian hybrid are presented in Table 2.

Table 2

Growth and development indexes of red Californian hybrids

Index	Experimental group	Control group
Number of worms pcs./m ²	2436	2520
Average weight of pubescent individuals, g	0,71	0,73
Average weight of young worms, g	0,3	0,32
Percentage of pubescent	43,4%	42,7%

Consequently, the addition of *Sambucus nigra* wood waste to the substrate does not reduce its value for the body of red Californian hybrids (Table 1). The number of worms, their average weight and the percentage of pubescent individuals in the population in the experimental and control groups is not statistically different.

Conclusions and perspective of further studies

High efficiency of vermicultivation for waste recycling (including wood waste) has been proved.

Addition to the substrate the *Sambucus nigra* wood (15%) does not reduce the quality of the substrate for vermicultivation.

The separated wood can be "returned" into the forest ecosystem as a high quality organic fertilizer for improvement of soil fertility.

The study of biochemical parameters of the obtained biomass and the efficiency of the biohumus application is perspective in further research.

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