

## **Study of the Volatiles, Released by Spruce Bark Beetle *Dendroctonus micans* (Coleoptera: Scolytidae)**

K. V. Lebedeva<sup>1</sup>, N. V. Vendilo<sup>1</sup>, S. A. Kurbatov<sup>1</sup>, V. A. Pletnev<sup>1</sup>, A. G. Lunev<sup>2</sup>,  
L.S. Matusevich<sup>2</sup>

<sup>1</sup>All-Russian Research Institute of Plant Protection Chemicals, Ugreshskaya 31,  
Moscow 115088 Russia

<sup>2</sup>All-Russian Research Institute of Forestry and Forest Mechanization, Institutskaya  
15, Pushkino, Moscow oblast, Russia

The great spruce bark beetle *Dendroctonus micans* (Coleoptera: Scolytidae) is a superaggressive xylophage harmful for various types of firs (*Picea* spp.), as well as for the pine *Pinus silvestris*, in all European countries, Russia, and Turkey,. Nowadays the spruce bark beetle is especially dangerous for the Chuvash Republic where its population, growing year by year, covers the area of 219 hectares. It also acts as a dangerous quarantine pest in Switzerland, Algeria, Argentina, and Iran. The best conditions for the high population of the great spruce bark beetle are observed in the forests near the Lake Baikal.

Taking into account the zonal and regional peculiarities and that the biology of *D. micans* markedly differs when it develops on various tree species, we studied the spruce bark beetle *D. micans* on the Ishim plain, Tumen' region, in 1993, where it damages the pine *Pinus silvestris*, and in 1994-1996, in Tula region, where it damages the fir *Picea abies*. The real population density in the samples from the Tumen' region was 3.3-10.6% from the overall number of trees.

In 1993, we studied volatiles evolved by *D. micans* residing in pines in Tumen region. For this purpose, we collected volatiles from both the pheromone cloud during stitching of a female in a tree and the air over a female after its stitching in a pine. In 1994-1996, we collected volatiles related to the life activity of *D. micans* inhabiting the fir. We collected the volatiles of the beetles stitching in the fir in spring, volatiles from their frass and the substances from the pheromone cloud of the beetles leaving for wintering. For differential diagnostics, compounds evolved by the fir bark and pine bark were collected and analyzed.

The main substances of the tree (pine or fir) are terpenes as more volatile substances than sesquiterpenes. The substances aggregating the larvae on the pine include norcamphor, carveolacetate, borneol,  $\alpha$ -terpineol, and verbenone.

The products of the life activity of the *D. micans* females inhabiting the pine are the substances, detected in the frass, including sabinenehydrate, borneolacetate, myrtenal, terpinene-4-ol, and farnesylovalerate, as well as the compounds, extracted from the air at the moment of stitching of the spruce bark beetle females, including 2,6-dimethyloctatriene-3,5,7-ol-2, pinocarvone, 4,8-dimethyldecanal, E-verbenol, Z-verbenol (traces), E-pinocarveol, sabinol (traces), 2-methyl-6-methylene-octadiene-3,7-ol-2, geranylovalerate, and terpineolacetate.

The products of the life activity of the *D. micans* female inhabiting the fir in spring are the substances, extracted from the frass, including  $\alpha$ -campholenic aldehyde, myrtenal, E-pinocarveol, myrtenol,  $\alpha$ -terpineol, 2-methyl-6-methylene-octadiene-3,7-ol-2 (traces), and borneolacetate, as well as the compounds additionally extracted from the air at the moment of stitching in the fir, including isoborneolacetate, sabinenehydrate, pinocarvone (traces), perillaldehyde, verbenone, borneol, terpineolacetate, nerylpropionate, farnesylovalerate, Z-7-dodecenylacetate, and tetradecanol.

The products of the life activity of the *D. micans* female stitching in the fir for hibernation include E-pinocarveol,  $\alpha$ -terpineol (traces), myrtenol (traces), borneolacetate (traces), sabinenehydrate, pinocarvone, verbenone, camphor,  $\alpha$ -phellandrene epoxide (traces), 2,7-dimethyl-1,6-octadiene-ol-3 (traces), 6-hydroxycamphene, carveolacetate (traces), geranyl butyrate, and myrcenolpropionate (traces).