



## **Methods for the synthesis of the sex pheromone of the pest of grain and grain products – yellow mealworm**

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### **Abstract**

One of the leading places in the development of fundamentally new plant protection products, characterized by high selectivity of action and safety in relation to the environment, belongs to pheromones – substances formed in the body of insects and affecting the behavior of individuals of the same species. Sex pheromones, which have an impact on the reproduction of the species and thus on its numbers, are most promising in practical terms. The yellow mealworm *Tenebrio molitor* – an insect with complete transformation from the order of *Coleoptera* – is widespread, most often found in bins of flour warehouses, bakeries, and mills. The developing larvae feed on grain, flour, bran, and baked bread. The harm caused by flour beetles is mainly due to the fact that they contaminate the flour with their feces and skins discarded during molting. The sex pheromone of the yellow mealworm *Tenebrio molitor* is 4-methylnonan-1-ol. The review article considers the syntheses of 4*R*-methylnonan-1-ol with various degrees of optical purity, which is the sex pheromone of the yellow mealworm *Tenebrio molitor*, a malicious pest of grain and grain products. It has been shown that there is considerable interest in the optically active sex pheromone of the yellow mealworm, and the development of effective ways of its synthesis is very urgent. The use of asymmetric synthesis to guide the 4*R*-center to the target molecule, as well as the use of high-purity optically active substrates, has a number of disadvantages: incomplete stereochemical homogeneity of the products of asymmetric reactions, low availability and high cost of starting compounds and reagents. It has been shown that the most expedient from the point of view of the biological activity/price ratio is the use of (*S*)-(+)-3,7-dimethyl-1,6-octadiene (*ee* 50%) – the main component of "technical dihydromyrcene", a product of thermolysis *cis*-(+)-pinan, widely used in the synthesis of aromatic substances in the chemical and perfumery industry.

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