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Effıcıent Envıronmentally Safe Plant Pestıcıdes

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Abstract

The presented article provides the results stemming from experiments of individual compounds and extracts of herbal terpenoids against termites, as well as growth, development and yield of rice, cotton and silkworm productivity.

Keywords: *pesticide, terpenoid, sesquiterpene lactone, secondary metabolites, Asteraceae family, termites, rice, cotton, silkworm.*

INTRODUCTION

The modern development of agriculture cannot be imagined without the widespread use of chemical plant protection products. To obtain high, high-quality and stable crop yields, a modern environmentally friendly innovative approach for the introduction of highly effective pesticides that meet modern technology and environmental requirements is necessary. In recent years, more and more attention has been paid to the introduction of natural biologically active compounds into medicine and agriculture. which have a wide range of biological effects, as well as environmentally friendly to humans and the environment. Therefore, the task of creating and using cheap, non-toxic natural drugs that operate in excess of low concentrations is very relevant today.

Currently, sesquiterpene lactones in the class of terpenoids attract the attention of a wide circle of researchers not only in their diverse structure and interesting chemical features, but mainly in practical importance. This class of compounds is one of the large groups of secondary plant metabolites with a wide spectrum of biological activity. A number of sesquiterpenic lactones are currently being used as anti-inflammatory, antitumor, anthelmintic, antiatherosclerotic, antimalarial, growth-regulating, insecticidal and antiviral drugs [1-5]. It is known that the biological activity of most sesquiterpenic lactones is due to the presence of an exocyclic methylene group conjugated to the lactone cycle. Their activity also depends on the presence in the molecule of oxide, peroxide, dienone, ester groups, as well as halogens.

Studies have shown that these secondary metabolites play an important role in protecting plants from pathogens, insects and mammals. We have studied a number of natural sesquiterpenic lactones from plants of the Asteraceae family (Compositae). Sesquiterpene lactones from plants were isolated by the method, including the extraction of crushed raw materials with ethanol, chloroform and due to the thermolability of lactones, the subsequent separation was carried out by chromatographic separation on a column with SiO_2 or Al_2O_3.

Insecticidal activity –Currently, termites, which cause enormous damage to historical cultural monuments, buildings, structures and strategically important objects, present a special danger and a serious problem in the social and economic life of society. Although large-scale work is underway to reduce the termite population, their distribution and the damage they cause is growing every year. Termites are social insects that can multiply quickly, endure the influence of extreme environmental factors and migrate from an unfavorable habitat to places more suitable for their habitat. Termites are able to preserve vitality and reproduce, even when part of the colony is torn off from primary reproductive individuals. Various chemicals used against termites have a short-term effect (3-5 days), and they also create problems associated with ecology and health, so the use of most of them is prohibited. In this regard, there is a need to develop new methods and means of controlling termites using poisonous food lures of intestinal prolonged action.

Recent studies have shown that cyclic sesquiterpenoids produced by plants of the Asteraceae and

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Apiaceae families are the most promising thermicidal preparations of intestinal prolonged action.For example, American researchers found that sesquiterpene lactone kniscin with a germacrane type of skeleton isolated from Centaureamaculosa and sesquiterpene ketone vulgarone B from Artemisia douglasiana led to a high mortality rate among invasive termites. It was established that V vulgarone was lethal for termites with a quick effect. On the fourth day after administration, Vulgarone B showed a 97% mortality rate. Knizin acted more slowly, and on day 15 after completion he led to 81% termite mortality.
Other authors found that the simultaneous use of several terpenoids with other additives leads to increased insecticidal activity. For example, a mixture of Vulgarone B and Kniscine in low concentrations resulted in 96-100% termite mortality on day 15 after application [6-7].
Our phytochemical studies established that the plants of the flora of Uzbekistan are rich sources of terpenoids. To date, as a result of joint research (TashSAU, IHRV AN RUz, Institute of Zoology AN RUz), a number of effective anti-termiticsesquiterpenoids of intestinal prolonged action from the domestic flora, such as kniscin, kumambrin A, artemisinin, artemannuin B, which, when used individually, have been identified, have been identified 96-100% termite death for 6-10 days of use (Table 1).

Thermicidal activity of sesquiterpene lactones

Tab. 1

Concentwalkie-talkies	Numberofterms	Observationday																			
		1		2		3		4		5		6		7		8		9		10	
		п	ж	п	ж	п	ж	п	ж	п	ж	п	ж	п	ж	п	ж	п	ж	п	ж
1. 0,001	20		20		20	1	19	-	19	2	17	-	17	2	15	5	10	7	3	3	0
2.0,003	20		20	4	16	4	12	4	8	1	7	7	0								0
3.0,001	20		20		20	-	20	-	20	5	15	-	15	7	8	7	1	1	0		0
4. 0,003	20		20	4	16	6	10	-	10	7	3	2	1	1	0						0
5. 0,001	20	12	8	-	8	-	8	3	5	-	5	3	2	-	2	2	0		0		0
6.0,003	20	3	17	1	16	2	14	5	9	1	8	-	8	3	5	5	0		0		0
Control	20		20		20		20		20	1	19	-	19	-	19	3	16	1	15	0	15

Note: П- dead termites, Ж- living termites
1,2 - Artemisinin; 3,4-kniscin; 5,6-kumambrin A.
As can be seen from the table, sesquiterpene lactones in low concentrations have high thermicidal activity causing 96-100% death of termites for 6-10 days. Thus, it can be concluded that the tested sesquiterpene lactones are the basis for the creation of highly effective protracted drugs of prolonged action [8].
- The antifidant activity of sesquiterpene lactones of artabine, arabsin, anabsin, artemolin, artenolide, chlorchissopifolin B, elegin, acroptilin and gyrcanin was evaluated in the test for eating mulberry leaves treated with lactone solutions, third-instar larvae of the silkworm Bombix. It was found that the larvae stopped feeding on the leaves of the mulberry tree treated with solutions of sesquiterpene lactones in conc. 0.1-1%

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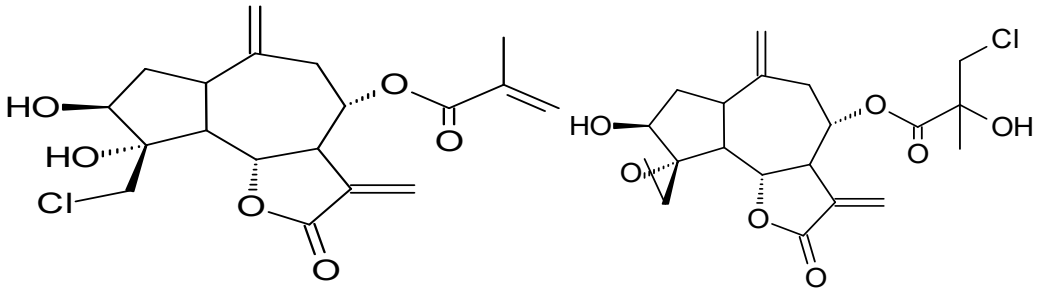
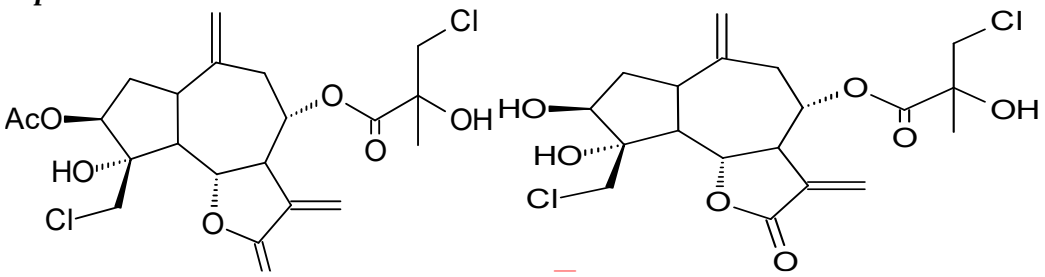


EleginAcroptillin



ГирканинСалегин

Growth control activity-A specific feature of plant growth bioregulators is their ability to influence processes that cannot be regulated by conventional agrotechnical methods of cultivating crops, such as irrigation, the use of fertilizers, etc. The use of plant growth regulators with a diverse spectrum of action contributes to a significant reduction in the use of plant protection products from diseases and pests. Therefore, an integrated approach to the use of plant growth bioregulators that have both growth-regulating and immunostimulating effects in the system of other technology elements is relevant at the present time. Currently, various plant growth stimulants are used in agriculture and they significantly increase the yield of various crops than organic and mineral fertilizers. From literary sources it is known that natural sesquiterpenoids -santonin, zerumbon and C16-guaianolid, isolated from various plants, are one of the most effective biostimulants for increasing rice productivity, and they increase rice yield after soaking the seeds in their solutions at a dilution of 1: 10000 compared to control by 10-14%. In our Republic, there are no effective bioregulators to increase rice productivity. Our studies have established that the plants of this. Asteraceaeflora of Uzbekistan are rich sources of biologically active sesquiterpenoids. For example, the aforementioned -santonin is produced by plants of the genus Artemisia (wormwood), which form huge wormwood pastures on a vast territory, and they can be successfully used as raw materials for producing -santonin in the required quantities for its use as a growth-stimulating agent. We also examined the growth-regulating activity of a number of sesquiterpenoids of liganolide, repin, granilin, and artabin, including -santonin, which we isolated from plants of the flora of Uzbekistan. To consider the growth of stimulating activity, the following methodology was used. The exact weighed portion of the terpenoid was taken, dissolved in warm water to a volume of 1: 10000, and the seeds of the Avangard variety were immersed in the solution. Treated seeds were planted on experimental small plots row by row at a distance of 15 cm. As the results showed, the most active growth regulators were α-santonin, liganolide and repin, which significantly increased rice yield by an average of 12.5%, and granilin,artabine and leukomyzinto 10% [9].

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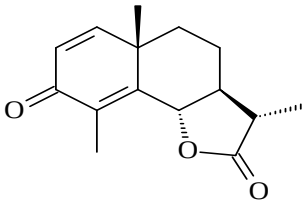
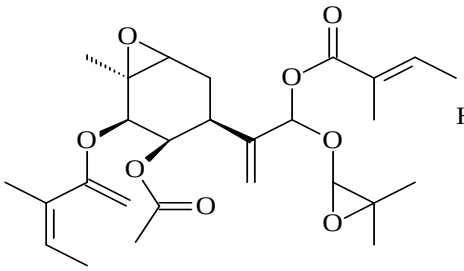
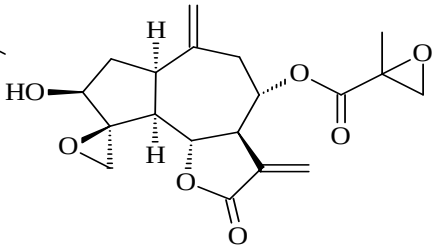


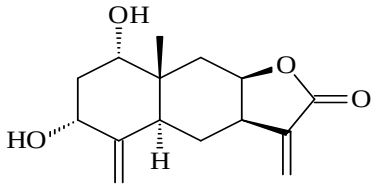
α-Сантонин



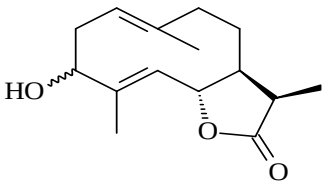
Лиганолид



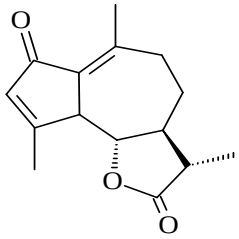
Репин



Гранилин



Артабин



Леукомизин

In the study of the mutagenic effect of Artemisia absinthium extractive substances (wormwood) on wheat and cotton, mutant lines were obtained. This article presents the results of field tests of the herbal preparation "LNG" (the sum of the bitter wormwood lactones) for cotton. It was found that at various concentrations of LNG has a pronounced biostimulating and mutagenic activity.

Cotton seeds of varieties C – 6524, C – 6532, C – 9070, etc. were treated with a preparation of various concentrations and sown in the field. The following indicators were analyzed: seed germination, plant survival and the degree of development of characteristics characterizing productivity. In the experimental versions, at concentrations of 1.0 and 0.5%, there is a pronounced stimulation, in particular, of the accumulation of fruit organisms on the bush, increase in the weight of raw cotton per plant, due to an increase in the number and weight of bolls. This drug in concentrations of 2 and 1% was used as a modifier to relieve depression during seed irradiation. For the study, grade C – 6524 was taken, as mutagenic factors — gamma rays Co60 and the LNG preparation at a concentration of 1 and 0.5%. Non-irradiated seeds, simply soaked in water, served as control, and the second control was simply irradiated seeds. As a result of research, a promising breeding material in the form of mutagenic lines and varieties was obtained. A number of promising mutagenic lines are being studied in the laboratory and in the nurseries of radiation mutagenesis [10].

We also studied the effect of the extractive sum of sesquiterpene lactones from bitter wormwood herb (Artemisia absinthium)) on the productive and reproductive properties of silkworm, since we previously isolated biologically active sesquiterpene lactones from this plant. To determine the biostimulating effect, the mulberry leaves were treated with an aqueous solution of the sum of sesquiterpene lactones until they were completely wetted in various concentrations. Caterpillars of the treated leaves were fed from the first day of the fifth age, daily, until the cocoons were curled. It was found that the use of aqueous solutions of the sum of the lactones of wormwood wormwood (0.1- 0.25%) leads to an increase in the productivity of the silkworm, which is expressed in an increase in silk bearing by 3.1% and yield by 20%.

Antiparasitic activity -A serious problem for the sericulture industry is the infectious diseases of the silkworm (nuclear and cytoplasmic polyhedrosis, pebrin, muscardine, flacheria). Their characteristic feature is infectiousness - the ability to be transmitted from one silkworm to another, and thereby to turn single cases of the disease into mass, dramatically reducing the yield and quality of cocoons.

These diseases, developing on the heels, reduce its quality. Only healthy grena free from microorganisms can ensure the normal development of the embryo during storage and incubation of the grena and makes

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it possible to obtain healthy caterpillars and, ultimately, a high yield of benign cocoons.

For disinfecting grena from bacterial, viral and fungal microflora, a purposeful search for new complex modern prophylactic agents of simultaneous and multidirectional action from the group of herbal preparations is necessary.

Currently, effective drugs used against silkworm infectious diseases are: the antibiotic kanamycin, which has high bactericidal and bacteriostatic properties, as well as the herbal preparation chlorophyllipt, serially obtained from eucalyptus leaves. Chlorophyllipt disinfects grena from bacterial and fungal microflora. The active substances of the preparation of chlorophyllipt obtained from eucalyptus leaves are monoterpenoids, as well as phenolic compounds. The disadvantage of these drugs is their weak antiviral activity [11].

For the experiment on testing the herbal preparation “PRP” (the sum of the lactones Artemisia annua, A.tenuisecta and Centaureasquarrosa) on the nosematosis infected grena, Ipacchi breed 1 was used.

Infected grena was taken into treatment after the end of the wintering period (diapause). Initially, it was kept in preparation for 3 days (at a temperature of + 16, + 17 ºC). Then subjected to its processing in aqueous solutions of the drug "PRP" in a 1.0% concentration.

After drying, the grains formed options for calculating the percentage of recovery and for microanalysis of caterpillars-animators for infection with pebrina. Grena was placed in an incubator for incubation. After the caterpillars emerged from the treated grena on the 3rd day, a revival count was performed (the amount of ungrounded grena was counted).

The rate of revitalization of grena characterized the positive or negative effect of the drug. Animated caterpillars that came out of the grena were not fed, and a microscopic analysis was subsequently performed for the content of nosematosis infection in them.

The results showed the liveliness of the grains in the treated variants was 97.0 - 98.0%, the infection of the caterpillars-animators ranged from 1.5 - 3.0%. When in the control variant, where the grena was not processed, the vitality of the grena was in the range of 93.5 - 95.6%, and the infection rate was 5.0-8.0%. After treatment, the vitality increased by 2.4-4.3%, and the infection rate decreased by 2.8-6.5%. [13]

After treatment with the “PRP” preparation, the grena was put into sale, that is, for feeding. The results of feeding the caterpillars from the indicated grains are presented in table 2.

Table 2. The results of feeding the caterpillars from the grains obtained after processing with 1.0% preparation "PRP".

№ п/п	№ parties	Repetitionamount	TrackViability(%)	The number of normal cocoons (%)	The average mass of one cocoon (g)	Harvest cocoons with 1g of caterpillars (kg)	Harvest with 1 box of tracks (kg)
1	121	20	86,9	85,0	1,83	3,11	59,0
2	134	20	90,1	81,9	1,89	3,01	57,2
3	130	20	88,2	80,3	1,91	3,07	58,3
4	139	20	89,4	82,1	1,94	3,18	60,4
Control untreated gren of the same parties							
5	121	20	69,0	61,0	1,73	2,11	40,0
6	134	20	66,3	58,1	1,78	2,07	39,3
7	130	20	62,8	59,0	1,79	2,11	40,0
8	139	20	64,1	61,3	1,71	2,0	38,0

Compared to the control, grains that were fed to grains after treatment with the preparation showed rather high results in terms of caterpillar viability, average weight of 1 cocoon, and yield from 1 g of caterpillars. This circumstance is explained by the fact that healthy caterpillars emerged from the treated grena. In the control variant (without treatment with the drug), slightly infected caterpillars emerged from

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the grena, which, during the feeding process, overdrive the other caterpillars. As a result, weakening and death of caterpillars was observed, characterized by low viability and low yield of cocoons.

Thus, the study of terpenoids of the flora of Uzbekistan is very relevant and promising, which will lead to the creation of new effective, environmentally friendly pesticides for humans and the environment, promising new varieties and increase crop yields, as well as the rational use of local plant materials.

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