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CREATION OF A CHEMICAL PREPARATION FOR THE PROTECTION OF AGRICULTURAL CROPS

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Abstract

The article discusses scientific considerations for the creation of a low-toxic chemical preparation that protects plants in an integrated way based on local raw materials and industrial waste.

Keywords: plants, diseases, pests, fungicides, insecticides, limestone, carbon dioxide, sulfur.

Introduction

The yield of the Republic from year to year is declining despite the support of measures aimed at deepening economic reforms in agriculture, modernizing all sectors of industry, efficient use of land and water resources, and the introduction of modern efficient agricultural technologies. According to data, 35% of the productivity of plants grown all over the world per year, and the remaining 14% perish - by pests and during transportation and storage [1].

Despite the presence of recommendations developed by scientists of the agrarian sector of the republic, the damage is still observed as a result of incomplete implementation of those adopted for use in agriculture, from pests and diseases. The geographical position and soil and climatic conditions of the republic are very favourable for the development of all types of agriculture. This, in turn, contributes to the spread of various pests affecting agricultural crops. Although the pest feeds on almost all parts of cotton, the main damage (over 80%) is caused by pests feeding on its organs. In general, the damage caused by arthropods to cotton varies from region to region and country and averages 19%. In Uzbekistan, there are 214 species of arthropods, including 203 species of insects [2].

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Materials and methods

Today, methods of organizational management of agriculture, agrotechnical, biological and chemical control of pests and diseases of agricultural crops are used [3]. The use of chemical pest control methods is simple and fast. Many pesticides are imported with foreign exchange. This, in turn, causes inconvenience to farmers. It should be noted that 88 out of 150 basic chemicals are produced directly from sulfur or its derivatives [4].

Sulfur plays an essential role in the preparation of mineral fertilizers and insecticides to fight plant diseases. Sulfur is one of the most widely used insecticides in the country against nightshade, alfalfa, pomegranate Comstock, fig butterfly and other rodent pests. Sulfur has repellent properties. Many branches of the modern chemical industry cannot function without sulfur and its compounds. However, the disadvantage of elemental sulfur is that it is very poorly absorbed by water, i.e. it is hydrophobic. This makes it difficult to obtain sulfur chemicals used against pests and diseases. Sulfur preparations in insecticides are not hazardous to humans and livestock. As sulfur insecticides are used: lime sulfuric broth (ISO), sulfuric talc, colloidal sulfur. But these insecticides have certain disadvantages. For example, the process of obtaining an ISO is complex and requires a lot of time and energy. Sulfur talc is yellow talc that does not dissolve in water. Therefore, it is impossible to prepare a suspension from it, and the amount of consumption when used is large. Colloidal sulfur is a yellowish-grey paste that is not highly hydrophilic in water. When stored in sealed containers, it dries out and becomes unsuitable for suspension [5].

Sulfur improves soil conditions and increases plant resistance to various diseases [9]. B.S. Boltaev showed that the use of a 2% suspension of sulfur soaked in the water against spiders on cotton gave them a high biological effect and increased the cotton yield by 3.7-6.0 centners, improving the technological properties of the fibre [10]. The effect of sulfur on the state of the soil and its ability to accumulate water-soluble nutrients in the soil was also studied [11].

In the scientific research of S. Gulimov, it was found that sulfur preparations have a positive effect on the development of cotton. With the development of sulfur-treated plants, the appearance of buds and stems, it was found that sulfur differs from plants in the area where sulfur is not used, and the yield is 7-12% higher [12]. As a result of the lack of sulfur, the veins of the leaves of plants turn yellow. It also reduces their resistance to low temperatures, drought and disease [13]. Due to the absence of sulfur compounds in agricultural crops, especially cotton,

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such lands need to be replenished with sulfur reserves. Sulfur preparations are highly effective against stratification, rust and other plant diseases, especially diseases and wintering pests of fruit trees, have protective and medicinal properties against pathogens. Plants assimilate sulfur from sulfuric acid salts, and the sulfur is returned to the body. After the death of plants and animals, the mineralization of proteins and other organic substances occurs. In this case, sulfur is liberated in the form of H2S. It, in turn, decomposes in the presence of sulfur bacteria with the formation of sulfuric acid, which reacts with soil cations to form salts that are easily absorbed by plants [3].

Protecting agriculture from pests is a complex and difficult process. All work in this direction should be carried out in accordance with modern requirements, economically and ecologically. The effect of sulfur on cotton pests [17-18] has been widely studied in many scientific studies. In fields where there is a risk of spider mite infestation, the problem has been solved by cultivating rows of 30 meters wide at the edge of the field using one of the special acaricides that are harmless to sulfur pesticides and beneficial insects until the cotton is gone. In such fields, the infestation of cotton by spiders is reduced by 75-80% [19]. When performing this task, instead of imported fungicides and insecticides, it becomes possible to create a low-toxic chemical product based on local minerals and industrial waste, which comprehensively protects agricultural crops from diseases and various pests. Our country is one of the countries with huge reserves of minerals and raw materials. Currently, more than 1717 deposits have been identified, about 1000 different promising minerals, 118 of which are various minerals. The organization of industrial production of preparations with insecticidal properties from the limestone mineral, the development of its regulatory and technical documentation requires information describing the physicochemical and mechanical properties of the mineral. Determination of bulk density is necessary for the design of warehouses, selection of bunkers and transport equipment. For example, limestone samples have a bulk density of 2042–2097 g/cm^3 with an average moisture content of 1.02–3.19% and a specific gravity of 3089–3117 g/cm^3.

Results and discussion

With an increase in humidity up to 5%, their value increases on average by 2.12 and 1.87 times, respectively. The natural slope angle in limestones is 65-85 °C, in

sulfur 44-45 ℃. Their relative density ranges from 2.051–2.731 g/cm^3. The results are shown in Table 1.

Table 1. Granularity of raw materials, %

Grain size, mm	Limestone(additionally processed)	sulfur
-2 - + 0,5	-	-
-0,5 - + 0,315	3,40	2,10
-0,315 - + 0,16	39,00	7,30
-0,16 - + 0,1	30,20	24,60
-0,1 - + 0,063	20,70	40,10
- 0,063 ≥	6,70	25,90
Total:	100	100

The rate of moisture absorption of raw material samples was also investigated under conditions of relative humidity of 50, 85 and 100% in desiccators.

Table 2. Physicochemical and commercial properties of limestone and sulfur samples.

Samples	Technological indicators				
	Humidity, %	Density,g/cm^3	Specific gravity, g/cm^3	The angle of repose, deg.	Leakage, seconds
Limestone	1,82	2,631	1,762	49	20
	2,57	2,823	1,863	57	24
	3,41	2,957	1,972	64	Does not leak
Sulfur	0,15	2,051	0,985	44	17
	0,28	2,122	1,075	44	19
	0,35	2,198	1,186	45	20

The balance of moisture absorption of raw materials was maintained for 11 days, and their value did not exceed 1.8-3.0% at a relative humidity of 50-85%. At a relative humidity of 100%, the moisture absorption of the samples does not exceed 0.98–1.0% for sulfur and 5.98% for limestone flour. The composition of the limestone and sulfur samples was studied by the methods of radiographic and thermal analysis. The results of radiographic and thermal analysis of limestone showed that the composition of the main amount of calcium carbonates was confirmed by the results of chemical analysis. Thermal analysis of sulfur showed three endothermic effects at 110, 130, 188 ℃ and three exothermic effects at 354, 429, 652 ℃. In the thermal analysis of endothermic and exothermic effects, losses were found in Fig. 1, the results of these losses are shown.

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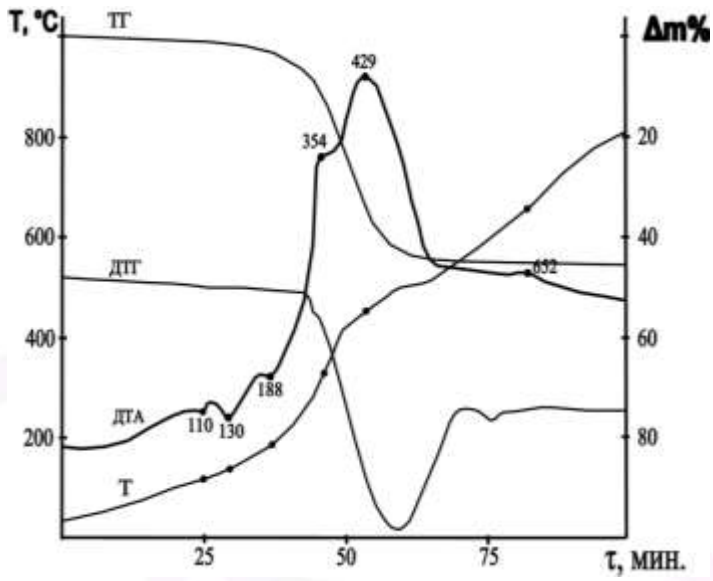

Figure 1. Derivatogram of sulfur

Conclusion

Thus, the importance of pesticides for the cultivation of rich crops has been described.

It was recognized that instead of imported fungicides and insecticides, it is possible to create a low-toxic chemical product based on local minerals and industrial waste, which comprehensively protects crops from diseases and various pests.

The composition and properties of the raw materials, selected to create a low-toxic chemical preparation that protects crops from harmful insects from limestone and industrial waste, have been studied using methods of chemical, physicochemical, physicomechanical analysis. The balance of moisture absorption of raw materials does not exceed 1.8-3.0% at a relative humidity of 50-85%. At a relative humidity of 100%, the moisture absorption of the samples did not exceed 0.98–1.0% for sulfur and 5.98% for limestone flour.

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