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DETERMINATION OF THE OPTIMUM PARAMETERS OF THE HYDROGEL PROCESS ON THE BASE OF LOCAL RAW MATERIALS

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Abstract

This research paper presents the analysis results of the process of obtaining hydrogel in the most optimal option for obtaining moisture-retaining complex fertilizer used in agriculture. Inorganic acids (HNO_3, H_2SO_4), caustic agent formalin, and organic acid were used to obtain hydrogel samples. The processes of drying hydrogels suitable for different soil-climatic conditions have been studied.

Keywords: hydrogel, FarPAN, nitric acid, sulfuric acid, formalin, choking rate.

In order to create a comprehensive system for the development of high-tech productions in the country and comprehensively support the active attraction of investments, develop a wide range of high-demand products, expand industrial cooperation and increase the export potential of the republic, based on cooperation with specialized enterprises in the republic, it is necessary master the production of chemical products, especially polymer materials and semi-finished products, used for the development of new types of products with added value [2].

Nutrition and proper care of crops, especially in areas where irrigation water is scarce, is of great importance for farmers to obtain a fruitful harvest. Sometimes we witness the death of plants due to lack of water. However, the emergence of a tool called hydrogel in agriculture greatly helps to prevent these and other problems [1]. Taking into account the above analysis, in order to prevent water shortages and introduce water-saving technologies, in this research work, research was conducted on the production of hydrogels with a moisturizing complex effect based on local raw materials. For this purpose, the FarPAN substance produced in FerganaAzot in the territory of our Republic, the caustic agent formalin, and nitrate, sulfate and organic acids for neutralization were used as the main raw materials [3-6].

In the previous research work, the caustic agent added to the FarPAN raw material, consumption rates of inorganic and organic acids for neutralization were analyzed with changes in percentage concentrations. Based on the results of the study, the optimal version of hydrogels was analyzed. In this work, analyzes of obtaining 2 different types of hydrogels were performed in the presence of nitric and sulfuric acids for neutralization. It can be seen in figures 1 and 2.

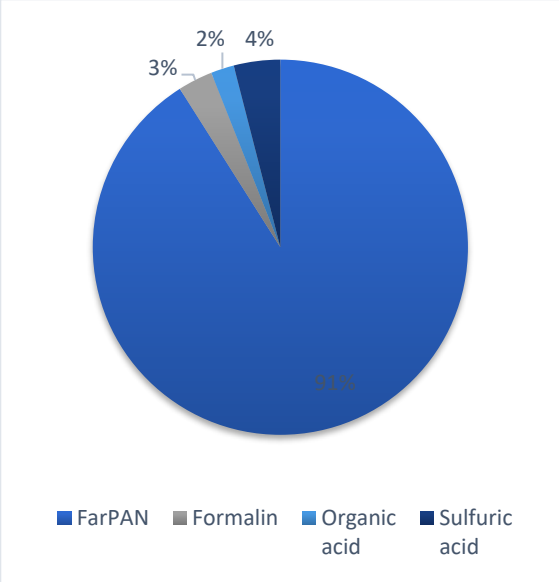

Figure 1. Sulfuric acid obtaining hydrogel according to the method

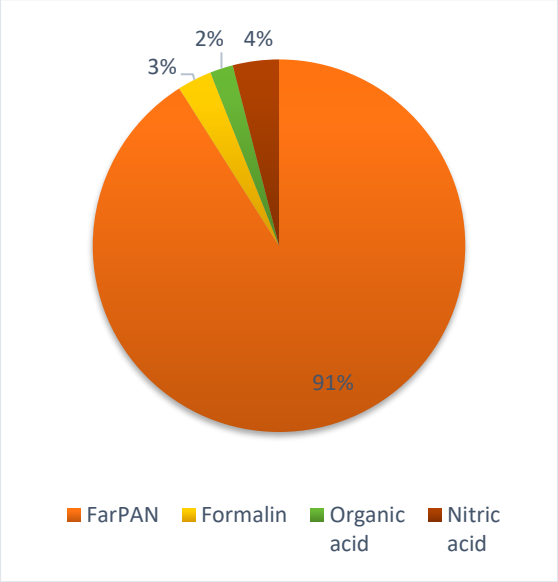

Figure 2. Nitric acid obtaining hydrogel according to the method

These pictures show the consumption percentages of raw materials. The raw materials were sequentially mixed for 3 hours using a laboratory-equipped mixer (model: OS20-S), a digital electric heater (model: HP550-S), and the process was monitored at a temperature higher than 70°C, with pH values (PHscan30 Pocket pH Tester). It can be seen in **Table 1.**

1-Table Parameters of action process of inorganic acids in hydrogel formation

Name of inorganic acid	pH environment	Gel formation start time, min	Gel formation start time, min	Product output (%)
Sulfate	5,22	16	69	91
Nitrate	5,69	19	65	92

In this table, analyzes of the pH index, product output, gel formation start and end times under the influence of inorganic acids on the process of hydrogel production are made. Because the optimal option was obtained in this study, it was observed that the yield of the product also differed by 1% under the influence of inorganic acids. The raw materials were added sequentially, and after adding the last raw material, it was observed that the gel formation time was 69 minutes in the sulfate method and 65 minutes in the nitrate method.

The obtained hydrogel was dried in a drying device at a temperature of 60°C. Then, based on the condition of the agricultural lands, the kinetics of soiling of the samples in the presence of alkaline NaOH (0.1 n), NH_4OH (5%), acidic HCl (0.1 n) and H_2O was studied. The results are represented in Figure 3.

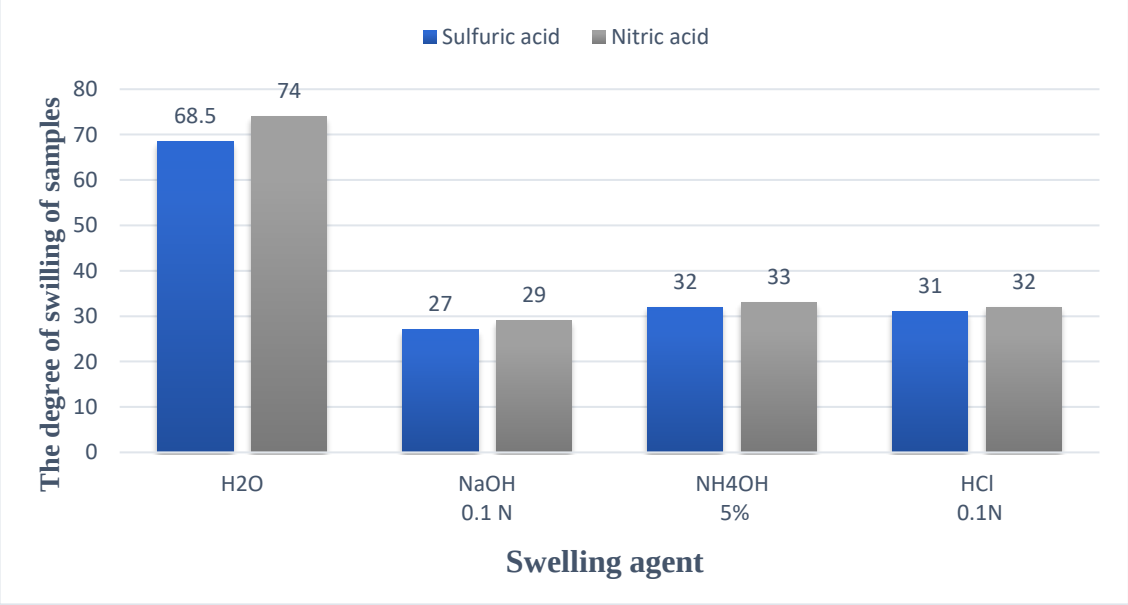

Figure 3. **Kinetics of swelling of hydrogel samples obtained in the presence of sulfuric and nitric acid**

In the figure, the decomposition kinetics of the samples obtained during the action of inorganic acids was analyzed. In the nitric acid method, the highest indicator of water solubility was 74 times, and in the sulfuric acid method, it was 68.5 times. When studying the degree of swelling of these hydrogel samples in different solutions depending on the state of the earth, the lowest index was 27 times in the sulfuric acid method NaOH 0.1 N solution, and the highest index was 33 times in the 5% solution of nitric acid NH_4OH observed.

In conclusion, it can be said that hydrogel removal processes were analyzed based on the optimal option in this study. In this study, the formation times and kinetics of the samples were studied. In future work, it is aimed to obtain fertilizers with a complex action of moisture retention by introducing different types of fertilizers in the process of taking these samples.

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