

A study of employing copper hydroxide to obtain tissue fibers from corn plant

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Abstract :

The present study aimed at obtaining tissue fibers from yellow corn seeds, by boiling (6 g) of yellow corn seed powder with a solution of sodium hydroxide diluted at a concentration of 4% for three days, Then it was washed with sodium hypochlorite and chlorine, spread in light strips and soaked again with 20% sodium hydroxide solution for two hours, I filtered with cotton wool to obtain a cohesive paste that was cut, chopped and left for two days at room temperature, After that, the crisp dough was taken and copper hydroxide was added to it and left for fourteen days.

An acid bath was prepared consisting of dilute sulfuric acid with sodium sulfate and zinc sulfate in addition to distilled water, The prepared material was injected by syringe and the results were to obtain long, bright fibers with a very soft texture with high elasticity, but lacking strength.

Keywords: textile fiber, corn, copper hydroxide.

* Sodium hypochlorite: It is known as a strong oxidizing agent in the form of a green or yellow-colored liquid, or what is called bleaching because it is the active ingredient in the bleaching process, and hypochlorite is a compound composed of the elements sodium, chlorine and oxygen, and its chemical formula is NaClO, and this compound results from the reaction of one ion of hypochlorite Its content in the compound is 5%, with one sodium ion.

* Sodium sulfate (Sodium sulfate), a chemical compound with the formula Na₂SO₄, which is the sodium salt of sulfuric acid, is present in anhydrous form and the crude form of it during its production is called salt cake, or in support with ten molecules of Na₂SO₄.10H₂O water and in this case it is called Glauber's salt. It is obtained almost equally and is either from natural or industrial sources, by-products of the manufacture of rayon, hydrochloric acid, chromium and lithium compounds.

* Zinc sulfate: a chemical compound with the formula Znso₄, which is a white crystalline powder.

Research problem :

The increase in the population of the earth in the world is witnessing a remarkable increase, as the number of the population in the world on the eleventh of July 1987 reached five billion people, so the United Nations sounded at a low risk, however, after two decades the number of the world's population increased to more than six One billion five hundred million people (**Brown 1995: p. 51**).

The United Nations estimated the rate of increase occurring at a rate of 79 million people annually between (2005 and 2015), and the world population at the end of 2009 reached about 6.9 billion people, and the United States 'population estimates indicate that the world's population has exceeded 7 billion. People for the year 2012. (**United Nations, 2019**).

In view of this increase in the number of the world's population, we need more clothing industry and its development to meet the increasing needs, and that the per capita consumption of woven clothes has increased greatly to achieve comforts for him, this calls for our need to find alternative means and methods and new ways to increase the production of woven clothes and other (**Saleh and others: p. 3**).

Our planet and the world at large suffers from water scarcity, which encourages and calls for finding alternatives to plant fibers by finding methods of manufacturing fibers that are considered semi-industrial or industrial, and the cultivation of cotton and linen is expensive at the present time due to its need for large quantities of water for irrigation (UN, 2011).

Yellow corn is also considered one of the most widespread crops in the world because it suits the most climatic conditions. It extends from latitude 58 north to latitude 40 degrees in Argentina as well as in the highlands and plains below and above sea level (Yunus: 1987, p. 88).

There was a need to search for a plant that consumes less water, and after researching the scientific sources, it was found that the corn plant is less water-consuming than other plants in which the need to extract the cellulosic fibers present in them (Journal of Agricultural Sciences, 2018).

Research importance:

Spinning and weaving is one of the old, important and renewable industries in the world, as Japan and many Arab countries have taken care to develop and put in place different and distinctive touches to ensure their modernity, to keep pace with the continuous development in those countries after they were limited to one country for the textile industry (Al-Salami, 2014). Also, the multiplicity and diversity of societies and the development of these days from the diversity of models in their forms and types obliges the family to keep pace with this development, to meet the needs of every member in the family for his appearance in a suitable manner, and the different cultures, ideas, religions, and the income of the family all determine the type, shape and quantity of what each individual needs (Abdin, 2008: p.17). Textile yarn was made from natural fibers until the end of the nineteenth century, but after that man resorted to innovating methods of preparing new fibers and came to prepare synthetic fibers of natural origin that by dissolving and depositing cellulose and considering the resulting fibers semi-synthetic (Abdeen, 1996: p. 3) .

The increase in the world population, water scarcity and environmental pollution are among the main reasons that make the fiber industry or the existence of alternative fibers capable of human consumption is a necessary thing that cannot be overlooked. Plants in general consume a lot of water for irrigation, and the world is witnessing a scarcity of water due to environmental pollution that causes global warming, which has led to the search for an alternative capable of providing fibers and strings from banana tree trunks, nettle or wood, etc. (Journal of Agricultural Sciences, 2018). The maize plant is one of the important crops in the world and is considered a staple food for many countries of South Asia, Latin America and South Africa, due to its availability in all countries of the world, but in general, the use of corn was limited as animal feed in the first place (Souad, 2011: p.1).

In addition to that, interest began to increase the production of corn crop in Iraq, and its cultivation was concentrated in a number of governorates, the most important of which are Baghdad, Babylon, Diyala, and Wasit, and it is economical and does not need much water for irrigation, as it irrigates between five to fourteen days and resists heat and soil salinity.

(Yunus and others) , 1987: p. 219).

The researcher found, through research and investigation of a plant that could be a suitable alternative to this crisis, and found that the corn plant is suitable for it, as it is the third crop in the world after rice and wheat in terms of area and production.

Research goal:

The current research aims to:
The possibility of manufacturing textile fibers from the yellow corn plant.

search limits :
The current search is determined by: -
1- objective limits:
Corn plant (yellow corn).

2- Spatial boundaries:

1-Ministry of Agriculture: Agricultural Research Department, Agricultural Research Division, Yellow and White Corn.

2- The Ministry of Industry and Minerals: The State Company for Textile and Leather Industry, Dar Al-Tazar, Woolen Factory, Packaging and Materials Division (laboratories).

3- The Ministry of Industry and Minerals: the State Company for Textile and Leather Industry, Dar Al-Tiraz, Woolen Factory, Central Quality Control Department

4- Ministry of Science and Technology: Department of Materials Research (laboratories).

3- Time limits: the academic year 2019-2020

Defining terms:

Recruit:-

He defined it (**the dictionary of jurists' language**) as employment and investment, or as practical employment. (**Dictionary of the Language of the Jurists, 2008**).

(**Al-Buraq Dictionary**) defined it as employing something to serve progress, investing it and employing it. (**Mujam al-Buraq, 2015**).

And (**the rich man**) defined it as employing it for the root of employment, which is employing something for advancement, operation and investment (**Al-Ghani, 2001**).

Procedural definition of the researcher:

Recruitment is putting something in its place in order to achieve the maximum benefit from it, which meets the purpose of its use.

Textile fibers:

He (**Al-Najjar**) defined it as a staple or a staple or a fiber that is a basic unit of the raw material, whether it is natural plant or animal. (**Al-Najjar: 1990**).

Arifaha (**Abdeen**) are primary materials that have a long filamentous or fibrous composition, bearing multiple characteristics, including staple length, flexibility, precision and surface roughness. (**Abdeen, Alia: 2008**).

And (**Howeidi**) defined it as the basic element of the textile material with a very precise diameter. As for its length, it depends. If it is short, it is called short or long fibers, then it is called filaments (**Howeidi, Iman Muhammad: Textile Science, University of Sudan, 2012**).

Procedural definition of the researcher:

It is the basic unit that constitutes textile materials, including plant and animal, bearing different characteristics, some of which are long and short, and they differ in terms of their smoothness, durability and accuracy of their diameters, formed by so-called capillaries.

Corn (**El Amin knew it**) An annual tropical herbaceous plant from the family (Poacees), which is considered one of the **plant**

widely cultivated plants and is characterized by its vitality because it contains large quantities of starch. (Al-Amin, 2019: p.2)

(And the chandeliers and others knew it) An annelid plant that reaches a height of more than two meters, and it is a monoecious plant with separate male and female flowers. (Al-Shammaa et al., 1987: p.21).

(And Chevalier knew it) An annual herb that is about a meter high and has feather-like, masculine flowers that produce the feminine flowering squashes. (Chevalier: 2010, p.152)

Search procedures

Research Methodology:

This chapter presents the procedures, steps, and methods that the researcher used in order to achieve the research objectives.

The appropriate approach to solving the research problem is to describe the phenomenon, reach its causes and the factors that control it, and draw conclusions for their generalization (**Researcher's Guide to Writing the Research and Its Form, 2015**). On this, he applied the descriptive and analytical approach as it is the most appropriate method for the success of the research through surveying and case studies to reach satisfactory results, which aims to use the corn plant to produce cellulose fibers.

The research sample

The sample was chosen in an intentional manner to be the most appropriate choice, and it was as follows:

- yellow corn.

Search tool

1 - Arab and foreign studies and scientific sites.

2- Discovering the appropriate methods:

The direction of the two researchers was, as shown, the manufacture of textile fibers through special treatments for chemical solutions for the purpose of liberating cellulose from the inside of the corn plant. The researcher also used new methods of extraction by changing the concentration of acid and base solutions in order to preserve as much as possible the natural properties of the manufactured fibers.

* The sample was taken from the Ministry of Agriculture / Agricultural Research Division for yellow and white maize, yellow corn of the synthetic variety Fajr 1.

Materials

and

working

methods:

For the purpose of conducting the practical steps for the research, it is necessary to provide what is necessary to facilitate the work and reach the best results, represented by: -

-

Tools

and

devices.

2-

Chemicals.

1- Table (1) shows the devices and tools used in the research procedures and the steps for working in it: -

Devices used

Device icon	Device type	the device name	ت
K ₃ :03	Sartorius	Sensitive balance	1
CB162	Stirrer Magnetic	Magnetic drive	2
VH DU14	Vhdu	Mill	3
يدوية	Road device	Ceramic hammer	4
18	Needles	Injection	5
	Medical gauze	Medical gauze	6
	Glassware	Glassware	7
	Conical flasks	Conical flasks	8

Definition of used devices:

1- Sensitive

It is a very sensitive experiments that need and picture (1)



electronic scale: - balance used in accuracy in weight, illustrates that.

Picture (1) of the sensitive electronic scale

2- The thermal magnetic engine: - It is a device used to mix and homogenize samples with solutions and mix them well. The picture below (2) illustrates this.



Photo (2) of the thermomagnetic actuator

3- The mill: A machine that breaks dry samples into fine parts that resemble flour, and the picture below (3) illustrates this.



Photo (3) the treadmill

4- The ceramic hammer: - A hand hammer that breaks materials into small pieces. The picture below (4) illustrates this.



Picture (4) the ceramic hammer

6- The syringe -: It is used to inject liquid materials of different sizes.

7- Glassware: These are laboratory tools made of glass that are used as needed. Some of them are used to shake and dissolve materials, and others to measure the amount of liquids and others. The picture below (6) illustrates that.



Photo (6) glassware

2- Chemicals used.

Table (2) shows the materials used in the research procedures:

Chemical Structure	Name of Substance
H₂O	Distilled water
Na OH	Sodium hydroxide
NACLO	Sodium hypochlorite.
H₂SO₄	Sulfuric acid.
Cl	Chlorine.
Na₂SO₄	Sodium Sulfate
ZnSO₄	Zinc sulfate
CUSO₄ 5H₂O	Anhydrous copper sulfate
NH₃	Ammonia.

The method of work :

The raw material of yellow corn seeds was used for the synthetic variety (Baghdad 3). Then the sample was taken and milled by electric mill to obtain yellow corn powder.

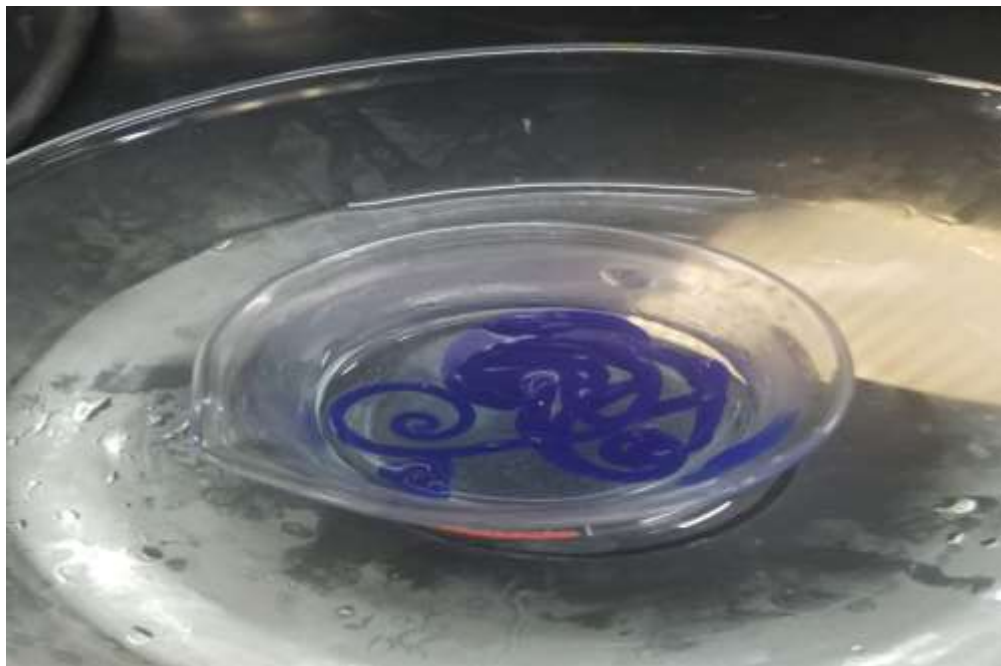
- 1- A sample of 6 gm of yellow corn powder was taken and boiled in a sodium hydroxide base converter at a concentration of 4%, and the thermomagnetic engine device was placed Image No. (2) to dissolve the bonds between its molecules.
- 2- Then the boiled sample was taken and washed by a solution of sodium hypochlorite (1 gm) with (1 ml) of chlorine to ensure that the cellulose escaped from this stage in a pure form (viscous liquid).
- 3-The cellulose extracted by chlorine was washed with sodium hypochlorite to bleach it and maintain its chain.
- 4- Brush the cellulose in glass plates in thin strips to ensure that the solutions in the following steps are permeated into all parts.
- 5- 5- To convert cellulose into cellulose soda, soak cellulose slices for two hours in sodium hydroxide at a concentration of 20%, preferably sodium hydroxide cooled at room temperature to ensure better results.
- 6- 6- The cellulose infusion (slides) is filtered by medical cotton * for its high density and squeezed well to obtain a soft and crisp paste of alkaline cellulose, and the brittle cellulose paste is left three hours to get rid of the excess sodium hydroxide solution.
- 7- 7- After filtering and disposal of the sodium hydroxide solution, a cellulose paste is taken and chopped well to obtain a more fragile cellulose substance.
- 8- Aging the base cellulose dough (cellulose soda) for 48-72 hours at room temperature, preferably between (21-23 ° C) to reduce the length of particles and reduce the degree of viscosity.
- 9- 9- The brittle cellulose dough is washed well with distilled water three times, then squeezed well to obtain a soft cellulose dough that contains a small percentage of distilled water and caustic soda.

* It is preferable to use medical cotton instead of filter paper because the material has a very high density that it cannot pass from the filter paper.

10- Preparation of copper hydroxide solution *:

- 1- Put 2 grams of anhydrous copper sulfate in a container containing 100 ml of distilled water and 15 ml of 10% dilute sulfuric acid.
- 2- Putting the materials on the magnetic stirrer device until we make sure of the solubility and homogeneity of the solution.
- 3- Adding 11 ml of ammonia to the solution prepared above and adding it through a separating funnel to ensure that it descends in the form of drops to form a blue precipitate.
The solution is filtered by a filtration funnel to separate the sediment and isolate the material from it.
- 5- Adding ammonia to the previously prepared blue sediment until the sediment is completely dissolved.
- 11- The brittle cellulose paste is soaked in the copper hydroxide solution prepared above for a period of fourteen days for aging, and placed in an isolated place with little light with daily monitoring and light stirring.
- 12- Preparation of a bath made of dilute sulfuric acid at a concentration of 8% with a little sodium sulfate 0,5 g and zinc sulfate 0,3 g, in addition to distilled water of 100 ml.

13- A sample is taken from the above-prepared substance using the syringe and placed in (the acid solution) for five minutes and then injected into the center of the acid bath.



Picture No. (8) Explain the injection of blue substance into the prepared solution

15- As soon as the injection process began, the sample reacted with the acid solution. The material shrank from blue to bright white fibers of continuous length, flexible and Figure (8) illustrates this.



Picture

No.

(9)

It shows how the fiber turns from blue to white

Discussing the research results:

Through what the researchers did, following a work method based on employing copper hydroxide to obtain tissue fibers, the experiment showed that after the injection process with the acidic medium, the sample interacted with the acid solution, which led to the material shrinking and turning it from blue to white fibers and its external appearance is as shown below :

1- Length:

Continuous unbroken fibers, and through the methods used in the research, the length of the fibers was according to the force of pressure applied to the syringe and at an angle of 45 ° to ensure that it did not break.

2- sparkle:

The resulting fibers were pure white with pronounced luster.

3- Shape:

The visible fibers are of regular shape.

The researcher was unable to study the rest of the properties of fibers (the results of the research) due to the current conditions that our dear country is going through by adhering to the decisions of the Crisis Cell to implement the decision of the comprehensive ban to combat the virus (Covid-19).

References:

- 1- Ibn Manzur, Abu al-Fadl Muhammad bin Karam bin Ahmed al-Afriqi: Lisan al-Arab al-Muheet 711 AH, Youssef Khayat Compilation, Dar Al-Jeel Publishing, Beirut, Lebanon, 1988.
- 2- Abu Zaid, Al-Shahat Nasr: Medicinal Plants and Herbs, Physiology and Production of Medicinal and Aromatic Plants, Crescent Publishing House and Library, Beirut, Lebanon, 2003.
- 3- Idris, Muhammad, Muhammad al-Tarkawi: Study of the relationship between the length and softness of the Syrian cotton fibers with the mechanical specifications of the annular threads produced from them using the method of statistical analysis, Al-Baath University, College of Chemical and Petroleum Engineering, Department of Textile and Textile Engineering, 2016.
- 4- United Nations: UN, Desertification and Population Increase, 2011.
- 5- United Nations, UN, Desertification and Population Increase, 2019.
- 6- Amin, Muhammad Mortada: The effect of residual nitrogen species on the growth, productivity and quality of yellow corn, Journal of the Saudi Society for Agricultural Sciences, King Saud University, 1 (2): 84, 106, 2017.
- 7- Brown, Leicester: Population and Planet Earth, translated by Leila Zaidan, Egyptian Society for the Diffusion of Knowledge and World Culture, Cairo, Egypt 1995.
- 8- Al-Bakri, Hoda Abdul-Razzaq Yunus: a study of mechanical properties of unsaturated polyesters reinforced with randomly woven glass fibers and the effect of acid solutions on some physical properties, University of Mosul, Technical Institute, Department of Chemical Industries, 2012.
- 9- Al-Jader, Adeeb Azza: The Textile Industry in Iraq, 1998.
- 10- Al-Jamal, Fayrouz Abul-Fotouh, Fathi Subhi Haris Al-Samadisi, Maryam Hassan Abdel-Salam Al-Bashbishi: The effect of some structural compositions of weft knitting jacquard on some functional properties of outerwear fabrics, Journal of Architecture and Arts, Faculty of Applied Arts, Damietta University, 2016.
- 11- Hassan, Yasser Muhammad Eid: Textile Technology and Textile Structures, Department of Fashion, College of Designs, Umm Al-Qura University, 2018.
- 12- Khalaf, Riyad, Majid Qasu, Badi Zerika: Determining the tensile strength of the fiber, the bundle and the thread, studying the relationship between them and assessing the strength of the thread, Damascus University of Engineering Sciences 2014.
- 13- Rahma, Hassan Salman, Muhammad Al-Saeed Dargham: Utilizing the modern technological capabilities of non-spinning weaving machines on the aesthetic aspect of women's fabrics produced from high-twist polyester fibers, Journal of Architecture and Arts, Issue 15, Department of Spinning, Weaving and Knitting, College of Applied Arts, University of Helwan, 2008.
- 14- Al-Rifai, Bilal Abdel-Wahab, Franco Karabet: Chemistry and Techniques of Dyeing and Textile Printing, Damascus University, 2017.
- 15- Al-Rifai, Bilal Abdel-Wahab: Chemistry and Techniques of Dyeing and Textile Printing, Department of Chemistry, University of Damascus, 2016.
- 16- Al-Salami, Intisar Hassoun Reda: The Chronological Evolution of Al-Hillah Soft Fabric Factory for the Time Period (2000-2010), Al-Adab Magazine, Issue 192, 2014.

17- Shammaa and Fakih, Abdul Hamid Ahmad Al-Bouni: Cereal and leguminous crops, their production and foundations for their improvement, 1987.

18- Sabouni, Tarif Haitham: The reality of the technology transfer process in the textile industries sector in the country, the Syrian Virtual University, 2010.

19- Abdin, Alia: The Introduction to the Study of Textile and the Basics of Executing Clothes, 1st Edition, Dar Al Masirah Publishing for Printing, Amman, Jordan, 2008.

20- Abdin, Alia: Studies in the Psychology of Clothes, 1st Edition, Arab Thought House for Printing and Publishing, 1996.

21- Abdul-Wahab, Souad Khairy, Najm Abdullah Jumaa, Wissam Malik Daoud: The effect of the direction of the lines and the distribution of plants on the growth characteristics of the yellow corn plant (*Zea Mays L*, Diyala Journal of Agricultural Sciences, 2009).

22- Al-Obeidi, Salah Hasan: Arab-Islamic Clothing in the Second Abbasid Era, Ministry of Culture and Information, Baghdad, Dar Al-Rasheed, 1980.

23- Ashmawy, Majida Abdel Jalil, Magda Mohamed Madi, Hoda Emad Mahmoud Hanafi: Problems of Manufacturing Outerwear for Women (Harem Abaya), The Egyptian Journal of Home Economics, 2015.

24- Al-Ghani, Abdul-Ghani Abu Al-Azm, Dictionary, 2001/1421.

25- Kabil, Tariq: Isolation of Genetic Mutations, Biotechnology, Faculty of Science, Cairo University, 2018).

26- Journal of Agricultural Sciences, Iraqi Ministry of Agriculture, 2018.

27- Mujam al-Buraq, 2015.

28- Qalaji, Muhammad: Dictionary of the Language of the Jurists, Second Edition, Dar Al-Nafaees for Printing, Publishing and Distribution, Beirut, Lebanon, 1988.

29- Al-Najjar, Amal: Textiles, Dar Al-Hikma Press for Printing and Publishing, Mosul, 1990.

30- Howeidi, Iman Mohamed: Textile Science, Sudan University, 2012.

31- Al-Younis, Abdul-Hamid Ahmad: Production and Improvement of Field Crops, Directorate of Dar Al-Kutub for Publishing and Printing, Ministry, College of Agriculture, University of Baghdad, 1993.

32- Al-Younis, Abd Al-Hamid Ahmad, and Faki Shaker Al-Shamaa: Cereals and Legumes - Theoretical and Practical-, 1987