

TECHNICAL UNIVERSITY OF THE NORTH

FACULTY OF ENGINEERING IN APPLIED SCIENCES



CAREER OF TEXTILE ENGINEERING

**GRADE WORK OF PREVIOUS DEGREE TO THE OBTAINING OF TEXTILE
ENGINEER'S TITLE**

**TOPIC: APPLICATION OF A COMPLETED ANTIBACTERIANO AND
IMPERMEABILIZANTE IN THE CLOTHES OF WORK FOR SAN GABRIEL'S
FARMERS USING SULFATE OF IT GETS PAID AND MICROEMULSIÓN DE
SILICONA.**

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APPLICATION OF A COMPLETED ANTIBACTERIANO AND IMPERMEABILIZANTE IN THE CLOTHES OF WORK FOR SAN GABRIEL'S FARMERS USING SULFATE OF IT GETS PAID AND MICROEMULSIÓN DE SILICONA.

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Problem.

Today in day the work in the agricultural field is one of the most productive sectors in the country, but the workers are exposed to adverse climatic conditions carrying out tasks and multiple works. However the type of garments that they use they don't consider aspects of functionality, protection, neither I design.

For the farmers' majority these tasks carry out them outdoors and in direct contact with the floor, it dilutes, fungicides and pesticidas, therefore are reverted in infections, allergies and other problems of health.

Abstract.

The present investigation gives to know a completed antibacteriano and impermeabilizante in work clothes, for the farmers that are in San Gabriel, using copper sulfate and micro silicona emulsion. It is applied in the textile industry whose main objective is, to eliminate causing undesirable microorganisms of illnesses, as well as that the fabric has a repelencia to the water, caused by rains, being this a process that contributes to new investigations in the textile industry. This whole process is exercised in having knitted gaberdine and jeans, which are resistant goods and very used in the garments of the farmers.

Chapter I. - he/she talks about the agriculture, the work conditions, the illnesses, risks and pollutants in all agricultural area, in which these people are exposed day by day, being an

area very difficult of controlling their health and security.

Chapter II. - it details about the novel ones textile intelligent and their types of textile intelligence as well as the textile finishes and their different classes of finishes in those that it is also included the completed antibacteriano and repellent giving great importance in the world of the textile ones.

Chapter III. - it defines the products copper sulfate and micro silicona emulsion with their diverse properties with the objective of giving to know the benefits that he/she offers the copper, to disable exposed bacterias to the human contact. As well as to talk about the repelencia property.

Chapter IV. - it details the practical part in which is the determination of the finish process with the help of copper sulfate and micro silicona emulsion, process by means of which is carried out it for the method of impregnation, in fabrics of high density, in a bathroom not very viscous, with their respective programming leaf, leaf pattern and it curves of process.

Determining the appropriate concentrations of 4g/l of copper sulfate and 35 g/l of micro silicona emulsion prescribes by means of the one which to providing bigger efficiency.

Chapter V. - it contains tests of confirmation of the completed antibacteriano and repellent with their different demonstration methods and technical leaves of the products.

Chapter VI. - it contains the determination of the laundry solidity, to the one it rubs, to light

and the resistance to the water of the carried out samples.

Chapter VII. - the respective analysis of costs of the carried out garments is and on on approval.

Chapter VIII. - it contains the due conclusions and recommendations after having concluded the investigation with their respective analyses.

1. Development process

The present investigation project will contribute to the agricultural sector to have a smaller risk of suffering certain illnesses.

The essential of the present investigative project is the application from these finishes to their garments of dressing newspaper, with the purpose of offering the user a new product that allows to improve the quality of life and people's health.

1.1. investigation area

This investigation was carried out in the county of the Carchi Cantón Montúfar (agricultural areas of San Gabriel).



Figures N°1 Sedding

The primordial thing is to end up obtaining a garment with an effect antibacteriano to avoid the appearance or propagation of bacterias and at the same time to obtain the repelencia to the water, obtaining a viable alternative in the agricultural sector.

2. Practical process

In this chapter the necessary procedure is described for the application of the completed antibacteriano and impermeabilizante in the different types of fabrics.

To begin the process of the completed anti-bacterial, and impermeabilizante it should be prepared the materials and laboratory teams that are detailed next:

2.1. materials

Teams	Material
Lighter	Knitted gaberdine
Glass precipitation	Knitted jeans
Scale	Sulfate of copper II
Bar agitation	Emulsion silica
Thermometer	Detergent
Test tube	Auxiliary products
Irons	It dilutes
	Acetic acid

Chart 4.3. Materials

2.2. Process parameters

The most important parameters to keep in mind during the process are detailed next:

- Concentration copper Sulfate.
- Concentration Micro silica emulsion
- Fabric type
- Ph

2.3. Analysis of the fabric

The fabric is since the primordial thing the application it depends on its ligament among denser it is this, better it will be its finish.

Gabardine		Jeans	
Cigar	Navy blue	Clear Blue	Indigo Blue
			
Ligament		Sarga	Sarga
Density	U	115	83
	T	51	55
Width fabric		150±2	160±2
Weigh		302.4 gr/m	283.5 gr/m
Composition PES/CO		65/35	65/35

Chart 4.1 Analysis of the fabric

2.4. Application proposal

COMPLETED	Anti bacteria-repellent	
Application	IMPREGNATION	
Concentration	1 gr/lt	10gr/lt
	2 gr/lt	20gr/lt
	3 gr/lt	30gr/lt
	4 gr/lt	35gr/lt
TIME	3 MIN	
Ph	4.5	
T° impregnation	35-40°C	
T° drying	100°C	
T° heater fixation	160°C	

Chart N° 4.2 application Proposal

One works with 4 concentrations of copper sulfate and 4 of silica micro-emulsion in 4 types of fabrics, of clear and dark tones. Without taking into account the fabric Dacron white color that was used for the confirmation of the antibacterial.

TREATMENTS				
MATERIAL/PRODUCTOS				
DACRON	WHITE			
GABRDINE	NAVY BLUE -CIGAR			
JEANS	CLEAR BLUE - INDIGO			
PRESCRIBES	1	2	3	4
Sulfate of copper	1	2	3	4
Microemulsión of Silicona	20	25	30	35
Macro emulsion	5	5	5	5
Bicarbonat	2	2	2	2
Acetic acid	0,1	0,1	0,1	0,1

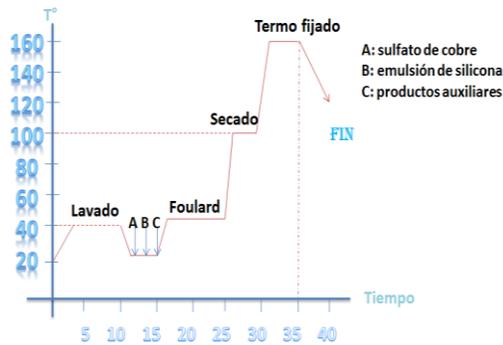
2.5. Process

1. Fabric type: the fabric in which was carried out the treatment will be of composition PES and CO of fabric plane.
2. To weigh the sample, with which we will work.
3. According to the weight of the fabric place the quantity of necessary water with a relationship of bathroom 1/30.
4. To wash the material to eliminate sludges or strange matters. .A 40 °C in 10 min.
5. To heat the bathroom relationship going up the temperature 2°C/min slowly.
6. To go up the temperature 35-40°C in 10 min
7. To place the products, antibacterial, silica emulsion and necessary auxiliary products in the process.
8. To control the pH of the bathroom that should be in acidity, so that the effect is bigger.
9. To control the pH with sour fórmico or acetic.
10. Place the sample in the bathroom.
11. Make go the sample by the foulard.
12. To dry the sample at 100°C.
13. To carry out the cured one to temperature of 160°C.
14. To analyze the results of the samples

For the process of impregnation of copper sulfate and micro silica emulsion to give a property antibacterial and repellent to the garments, a leaf pattern has been elaborated being detailed the used textile products and another necessary information in the process like it is its process curve.

It is necessary to emphasize that the leaf pattern and the process curve used in the treatment are same in their products, it only changes their concentrations, what is shown next is the leaf pattern and it curves of process of the recipe N°4.

HOJA PATRÓN						
Datos informativos						
Material: PES/CO						
Método: Impregnación						
R/B: 1/30						
Temperatura: 40 °C						
pH: 4.5						
PROCEDIMIENTO:						
Peso de material:	Volumen	%/gr				
20	600	100				
		1000				
PRODUCTO	gr/lt	%	gr	kg	costo /kg	subtotal
Detergente		1	0,2	0,0002	1,34	0,000268
Sulfato de Cobre	4		2,4	0,0024	1,34	0,003216
Emulsión Silicona	35		21	0,021	6,03	0,12663
Bicarbonato	2		1,2	0,0012	4	0,0048
Macroemulsion	5		3	0,003	8,5	0,0255
Acido	0,1		0,06	0,00006	2	0,00012
					TOTAL	0,160534



3. Analysis Anti-bacteria and Repellent

3.1. Analysis anti bacteria by means of the method of the blue stain.

I have used the following chart of evaluation of the completed antibacterial in which the values comparative averages of each fabric type carried out with the concentration of copper sulfate is shown.

Evaluation of the Completed Anti bacteria	
	With treatment
	Lightly treaty
	Good treatment
	Lightly not treaty
	Without treatment

Chart N° 5.2 Sample The Evaluation Anti bacteria

To determine if the product has the property anti bacterial, we subject the fabric treaty and without trying to a dye, in a relationship of bathroom de150 mL with a 1mL of the breakup of acetic acid and 0.1 gr/lt of blue Nylosan F2 2FL 100%. Obtaining the following results in having knitted jeans clear blue and gaberdine cigar.

Material: PES/CO		COLOR: CLEAR BLUE	
Evaluation	Lightly treaty		
Without treatment	Anti bacteria	Anti bacteria 1 gr	
Anti bacteria 2gr +	Anti bacteria 3gr	Anti bacteria 4gr	

Chart N° 5. 1 Evaluation Stains Blue Knitted Jeans

Material: PES/CO		COLOR: CIGAR	
Evaluation	Lightly treaty		
Without treatment	Anti-bacteria	Anti-bacteria 1 gr	
Anti-bacteria 2 gr	Anti bacteria 3gr	Anti bacteria 4gr	

Chart N° 5. 4 Evaluation Stains Blue Knitted gaberdine

Result: we can conclude that the fabric obtains an evaluation of lightly treaty with a concentration of 4 gr/lt.

3.2. Analysis Microbiológico by means of the Norma

He/she consists on carrying out an analysis using a segment of 1 cm² of each sample by means of the bio-breakup technique in peptona water, then it is poured in a box Petri with agar PCA. He/she leaves it to him in incubation for 24h. Finally he/she is carried out a contaje of units formadoras of colonies.

It is shown in the Annex N° 14 of the Analysis microbiológico of the fabric with completed antibacterial to 3% and another without finish.

Parameter analyzed	Unit	Result		Method
		1	2	
Recount aerobes	UFC/c	41	21	AOAC.989
Mésofilos	m			.10

Annexed N° 14 quantitative Analysis

Result: Obtaining a reduction of the 50%de bacterias in a concentration of antibacterial of 3%.

3.3. Repellent analysis by means of leak

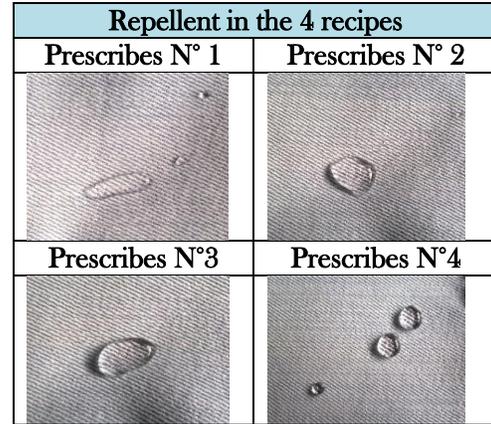
After the cloth was treated you proceeded to determine if the product has the repelencia property, subjecting the cloth of PES/CO with treatment, safe against water, using the following evaluation standard:

MÉTODO ESTÁNDAR DE EVALUACIÓN DE REPELENCIA		
		
100 (ISO 5)	90 (ISO 4)	80 (ISO 3)
		
70 (ISO 2)	50 (ISO 1)	0

100: it is not wet
 90: lightly wet
 80: it is wet as points of dew.
 70: partially wet beyond points of dew.
 50: totally wet
 0: wet completely the whole face of the sample.

Chart N° 5. 2 Standard Method of Evaluation of Repelencia

Obtaining the following results in the fabric jeans clear blue.



We can deduce that to more concentration bigger repelencia.

4. Methodological procedures

The carried out process was with products that don't cause damage to the human being, as well as products that ameriten to reduce production costs so that they are of easy acquisition for the consumer.

The process was carried out with the purpose of knowing in the textile goods the properties of the products Sulfate of Copper and Micro emulsion of Silicona, the first one is antibacteriana, able to eliminate or to impede the development of bacterias and the second impermeabilizante like repellent product to the water and other substances you tune.

He/she was carried out test on approval until determining that the concentrations of the product antibacterial are the appropriate ones. This was determined by means of an analysis microbiológico and also using the method of the blue stain.

He/she was also carried out repelencia tests but taking into account that the completed

antibacterial is still conserved, for that which was necessary to add auxiliary products to the bathroom so that an encapsulamiento of products exists and this way to be able to carry out the water heater fixation.

You proceeded to carry out tests antibacteriales like repellent to give had finished the process.

In a same way he/she was carried out tests of solidity to the samples with treatment and attaching their results.

With the ideal recipe and after having known the effects of the solidity, you proceeded to give treatment to the garments.

Subsequently these garments with treatment were put on approval in the farmers.

Obtaining comments on the part of them of feeling fresh.

This way it is given had finished the investigation process.

5. Results of the Process

In the Charts N°5.3 - 5.4 - 5.5, the evaluation antibacterial is shown, of the fabrics in clear tones which the analysis microbiológico was carried out by means of the method of the blue stain demonstrating that completed antibacterial exists to 4 g/l of concentration of the product antibacterial.

In the Charts N° 5.8 - 5.9 - 5.10 - 5.11 sample the repelencia in the different fabrics existing bigger repelencia together to a concentration of 35 gr/lit with the macro-emulsion that I help in great measure to maintain the repelencia.

6. Solidity

6.1. Solidity to the Laundry.

It is the solidity basically to the domestic laundry. This laundry was carried out to the same fabric for 10 serial times.

Without treatment	With treatment
	
1st laundry	10th laundry
	

Chart N° 6. 1 Solidity to the Laundry

Conclusion: we can conclude that in each washed the fabric goes losing the anti bacterial and at the 10mo washed it already lost it in great measure.

6.2. Solidity to the one rubs

It consists on demonstrating if to the close contact of the fabric and the skin, this fabric still continues maintaining the completed one and he/she doesn't get lost for the perspiration.

Without treatment	With treatment
	
Shows gaberdine	
	
Shows jeans	
	

Chart N° 6. 2 Solidity to the one rubs

Conclusion: we can deduce that the finish gets lost due to the perspiration for what the finish is not very solid to the one it rubs.

6.3. Solidity to the solar light:

He/she refers to the effect that produces to expose the sample with the completed anti-bacteria and repellent in the sun, during 3 days to check if the samples still continue maintaining their finish.

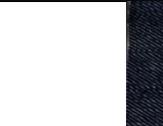
Without treatment	With treatment
	
Shows gaberdyne	
	
Shows jeans	
	

Chart N° 6. 3 Solidity to the solar light

Conclusion: one can deduce that the finish is resistant in the sun because the treatment didn't get lost when being exposed the sample in the sun.

6.4. Resistance to the water:

In this test a drop of water was placed in the samples with treatment he/she stops later on to take the time in each one of the samples carried out with the recipe N°4.

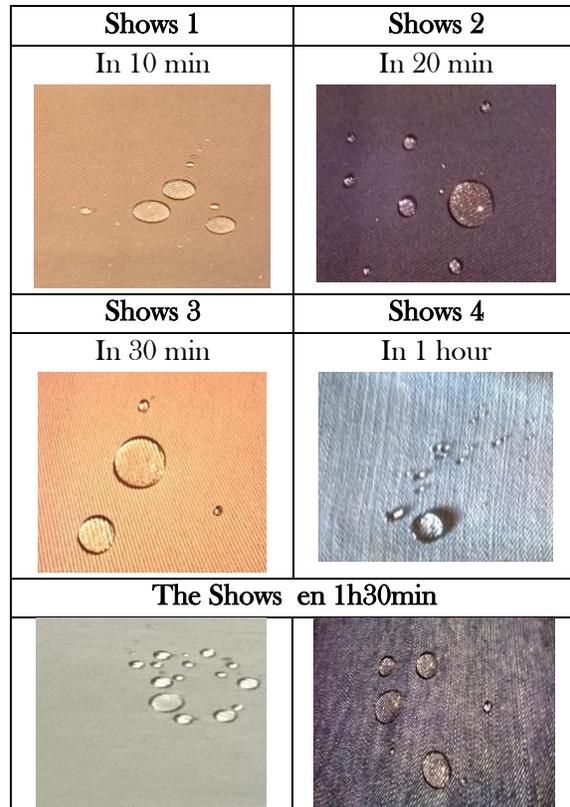


Chart N° 6. 4 Resistance to the Water

7. Price Unitary

In the following charts it is detailed the items corresponding to the costs of completed antibacteriano and impermeabilizante, considering expenses in materials and used products and other expenses incurred in the process. The cost this carried out in 2 you are captivated pant and carried out shirt and positions on approval.

7.1. COST PRODUCTS:

HOJA PATRON PARA UNA CAMISA						
PESO MATER	292	R/B			2920	
1000					100	%
Productos	S/Kg		GR	KG	PRECIO	
Detergente	1,34 %		1	2,92	0,00292	0,0039128
Sulfato De Cobre	1,34 gr/lit		4	11,68	0,01168	0,0156512
Emulsion Silcona	6,03 gr/lit		35	102,2	0,1022	0,616266
Bicarbonato	4 gr/lit		2	5,84	0,00584	0,02336
Macroemulsion	8,5 gr/lit		5	14,6	0,0146	0,1241
Acido Acetico	1,65 gr/lit		0,1	0,292	0,000292	0,0004818
Azul Nylosan	4 gr/lit		0,1	0,292	0,000292	0,001168
COSTO TOTAL						0,78

HOJA PATRON PARA UN PANTALÓN						
PESO MATER	352	R/B			3520	
1000					100	%
Productos	S/Kg		GR	KG	PRECIO	
Detergente	1,34 %		1	3,52	0,00352	0,0047168
Sulfato De Cobre	1,34 gr/lit		4	14,08	0,01408	0,0188672
Emulsion Silcona	6,03 gr/lit		35	123,2	0,1232	0,742896
Bicarbonato	4 gr/lit		2	7,04	0,00704	0,02816
Macroemulsion	8,5 gr/lit		5	17,6	0,0176	0,1496
Acido Acetico	1,65 gr/lit		0,1	0,352	0,000352	0,0005808
Azul Nylosan	4 gr/lit		0,1	0,352	0,000352	0,001408
COSTO TOTAL						0,95

Charts 7.5-7.6 Costs of the products

7.2. INDIRECT EXPENSES

Manpower: As in the process I take a long time 40 min then taking the time from the cloth laundry until the water heater fixation the manpower cost it is:

I weld basic = 354 USD

USD / day = 11,8

USD /hora = 1,475

USD/min=0,0245

0,0245\$X40min=0,98 \$for each garment

Electric power. he/she is carried out according to the Cost of the schedule of 0,14usd/Kwh

When carrying out the finish process he/she took a long time 40 min of which 10min only waste away electric power:

The used appliances work at 110V, their motor is of 0,5 Hp.

1 Hp 0.75Kwh

0.5 Hp X

X = 0.375 Kwh

1 Kwh 0.14 Usd

0.375 Kwh X

X = 0.0525 Usd

0.375 KW 60 min

X 10 min

X = 0,06 Kwh

He/she irons + Drying =

0.0525kwh x 0,06=0,00315 x 2 =

0,0063 \$por each garment

It dilutes. -for the calculation of the water he/she took into account the garments that were carried out and on on approval:

I weigh pant jeans 392gr

I weigh shirt 260gr

I weigh total prendas=392+260=652gr

The bathroom relationship is of 1/10 because he/she leaves to work in garments, then one works with a volume in 1/10=6520ml

For the process of the finish it was used that is to say in the two garments 6520 ml 6,52 lt. The cost of the drinkable water for the realization of the finish, obtained it to him according to the consumption of water, you 0.45/m³. For that which was carried out the following calculation.

0.45/m³.....1000 liters

X.....6,52 lt =

6,52 X 0,45/1000=0,002934 \$

Other expenses	Cost
Manpower	1,96
Electric power	0,0126
It dilutes	0,002934
Total	1,98

Chart 7.4 Indirect Expenses

It is necessary to emphasize that the alone investigation is the finish process in the garments, reason for which the matter item is not detailed prevails this since it was only used to determine the ideal concentration and then to be able to apply it in the garments.

Obtaining the cost in the following way:

TOTAL COST OF THE PROCESO	CAMISA	PANTALÓN
Products recipe N°4	0,76	0,95
Other expenses	0,99	0,99
Total	1,77\$	1,94\$

Chart 7.7. Total Cost

8. CONCLUSIONS:

-  You concludes that for the practice each used product, it has been investigated by means of their technical leaves that don't contain any compound that can cause reactions when being in contact in the body or in the human being skin, it is specified in the chapter V.
-  Knowing the properties of the micro silica emulsion you concludes that if there was repelencia using at the same time a macro emulsion that I help in great measure to react and to obtain the impermeabilización, because the micro emulsion reacts in the textile of better way like a suavizante. It is specified in the Chart 3.2
-  You concludes that after carrying out the analyses of bacterias and repelencia of carried out samples, he/she puts on on approval in different phases of the farmers' work, obtaining comments on the part of

them of feeling fresh and with less perspiration. To see annexed 11

-  Inside the experimental process that was carried out in the fabric anti-bacterial a very good one it was obtained been since it could be proven the effectiveness of the product used in the practice, reducing in great measure the bacteriological growth by means of a count of bacterias. To see annexed 14
 -  After having carried out different tests I conclude that the tests that better result was obtained those that have a concentration of 4 g/l of copper sulfate, 35g/l of micro silica emulsion and certain auxiliary products were that together helped to that exists anti-bacterial and repelencia in the carried out samples. To see recipe N°4
 -  The data that were obtained of the analyses, with regard to the methods used for the confirmation of the completed anti-bacterial and impermeabilizante showed that the used products if they were the appropriate one in the practice. To see annexed. 8
 -  You concludes that these finishes are applied in fabric plane, because the ligament is very important in the process.
- ## 9. RECOMEDATIONS
-  Once concluded the investigation work and after having carried out different tests it is recommended to use recipe with a concentration of 4 g/l of copper sulfate, 35g/l of micro silica emulsion, since it is the formula that gave us better results.

- It is recommended to carry out other types of finishes as for example a completed anti-UV, moisturizer in garments used by the farmers that are beneficial for them because they are exposed to severe risks in their health.
- It is recommended that the garments that present completed antibacterial and repellent they should be used by the farmers in the whole time of work because each moment is witnessed the bacterias as well as the different climates.
- It is recommended to continue with the study, in other labor areas where it exists severe risks of health, like they are people that work in albañearía, recolectores of garbage who are, those that it forms of equal they are exposed to bacterias and the bleakness.
- It is recommended to keep in mind each parameter it is necessary to carry out the finish, the adjustment of the pH and their maintenance between constant acid during the finish it is very important and consequently decisive for the good result of the same one.
- It is recommended that it stops good results in the completed antibacteriano and repellent the process, neither its curve should not be varied but rather to investigate better assistants that can help to its reaction before the fiber.
- It is recommended to investigate more envelope these finishes to be able to reduce their costs, and this way to be able to have a great demand in the garments that present the different finishes.
- It is recommended to carry out an exclusive and comfortable design in the garments of the farmers, in which he/she was carried out the treatment.

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