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 COPPER 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](image)

The primordial thing is to end up obtaining a garment with an effect antibacteriano to avoid the appearance or propagation of bacteria 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 antibacterial, and impermeabilizante it should be prepared the materials and laboratory teams that are detailed next:

### 2.1. materials

<table>
<thead>
<tr>
<th>Teams</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighter</td>
<td>Knitted gaberdine</td>
</tr>
<tr>
<td>Glass precipitation</td>
<td>Knitted jeans</td>
</tr>
<tr>
<td>Scale</td>
<td>Sulfate of copper II</td>
</tr>
<tr>
<td>Bar agitation</td>
<td>Emulsion silicona</td>
</tr>
<tr>
<td>Thermometer</td>
<td>Detergent</td>
</tr>
<tr>
<td>Test tube</td>
<td>Auxiliary products</td>
</tr>
<tr>
<td>Irons</td>
<td>It dilutes</td>
</tr>
<tr>
<td></td>
<td>Acetic acid</td>
</tr>
</tbody>
</table>

**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 silicona 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.
2.4. Application proposal

<table>
<thead>
<tr>
<th>COMPLETED</th>
<th>Anti bacteria-repellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>IMPREGNATION</td>
</tr>
</tbody>
</table>

- **Concentration**
  - 1 gr/lt
  - 2 gr/lt
  - 3 gr/lt
  - 4 gr/lt
  - 10 gr/lt
  - 20 gr/lt
  - 30 gr/lt
  - 35 gr/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 micro-silicona 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.

<table>
<thead>
<tr>
<th>MATERIAL/PRODUCTOS</th>
<th>DACRON</th>
<th>GABRDINE</th>
<th>JEANS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dacron White</td>
<td></td>
<td>Navy Blue-Cigar</td>
<td>Clear Blue - Indigo Blue</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRESCRIBES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfate of copper</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Microemulsion of Silicona</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>Macro emulsion</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Bicarbonate</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Acetic acid</td>
<td>0,1</td>
<td>0,1</td>
<td>0,1</td>
<td>0,1</td>
</tr>
</tbody>
</table>

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, silicona 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 silicona 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

Peso de material:

<table>
<thead>
<tr>
<th>Volumen</th>
<th>%/gr</th>
<th>20</th>
<th>600</th>
<th>100</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detergente</td>
<td>1</td>
<td>0,2</td>
<td>0,0002</td>
<td>1,34</td>
<td>0,000268</td>
</tr>
<tr>
<td>Sulfato de Cobre</td>
<td>4</td>
<td>2,4</td>
<td>0,0024</td>
<td>1,34</td>
<td>0,003216</td>
</tr>
<tr>
<td>Emulsión Silicona</td>
<td>35</td>
<td>2,1</td>
<td>0,021</td>
<td>6,03</td>
<td>0,12663</td>
</tr>
<tr>
<td>Bicarbonato</td>
<td>2</td>
<td>1,2</td>
<td>0,0012</td>
<td>4</td>
<td>0,0048</td>
</tr>
<tr>
<td>Macromulsion</td>
<td>5</td>
<td>3</td>
<td>0,003</td>
<td>8,5</td>
<td>0,0255</td>
</tr>
<tr>
<td>Ácido</td>
<td>0,1</td>
<td>0,06</td>
<td>0,0006</td>
<td>2</td>
<td>0,0012</td>
</tr>
</tbody>
</table>

TOTAL 0,160534

PROCEDIMIENTO:

Material: PES/CO
Método: Impregnación
R/B: 1/30

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.

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.

<table>
<thead>
<tr>
<th>Material: PES/CO</th>
<th>COLOR: CLEAR BLUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Lightly treaty</td>
</tr>
<tr>
<td>Anti bacteria</td>
<td>Anti bacteria</td>
</tr>
<tr>
<td>Without treatment</td>
<td>1 gr</td>
</tr>
<tr>
<td>Anti bacteria</td>
<td>Anti bacteria</td>
</tr>
<tr>
<td>2gr</td>
<td>Anti bacteria</td>
</tr>
<tr>
<td>3gr</td>
<td>Anti bacteria</td>
</tr>
<tr>
<td>4gr</td>
<td>Anti bacteria</td>
</tr>
</tbody>
</table>

Chart N° 5.1 Evaluation Stains Blue Knitted Jeans

<table>
<thead>
<tr>
<th>Material: PES/CO</th>
<th>COLOR: CIGAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Lightly treaty</td>
</tr>
<tr>
<td>Anti bacteria</td>
<td>Anti bacteria</td>
</tr>
<tr>
<td>Without treatment</td>
<td>1 gr</td>
</tr>
<tr>
<td>Anti bacteria</td>
<td>Anti bacteria</td>
</tr>
<tr>
<td>2gr</td>
<td>Anti bacteria</td>
</tr>
<tr>
<td>3gr</td>
<td>Anti bacteria</td>
</tr>
<tr>
<td>4gr</td>
<td>Anti bacteria</td>
</tr>
</tbody>
</table>

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 pectona 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 countaje 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.

<table>
<thead>
<tr>
<th>Parameter analyzed</th>
<th>Unit</th>
<th>Result 1</th>
<th>Result 2</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recount aerobes</td>
<td>UFC/cm³</td>
<td>41</td>
<td>21</td>
<td>AOAC.989.10</td>
</tr>
<tr>
<td>Mesofílos</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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:

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.

<table>
<thead>
<tr>
<th>Repellent in the 4 recipes</th>
<th>Prescribes N° 1</th>
<th>Prescribes N° 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prescribes N° 3</td>
<td>Prescribes N° 4</td>
</tr>
</tbody>
</table>

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/l 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.

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.
**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 antibacteria and repellent in the sun, during 3 days to check if the samples still continue maintaining their finish.

<table>
<thead>
<tr>
<th></th>
<th>Without treatment</th>
<th>With treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shows gaberdine</td>
<td><img src="image1" alt="Shows gaberdine" /></td>
<td><img src="image2" alt="Shows gaberdine" /></td>
</tr>
<tr>
<td>Shows jeans</td>
<td><img src="image3" alt="Shows jeans" /></td>
<td><img src="image4" alt="Shows jeans" /></td>
</tr>
</tbody>
</table>

*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.

<table>
<thead>
<tr>
<th></th>
<th>Shows 1</th>
<th>Shows 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image5" alt="Shows 1" /></td>
<td><img src="image6" alt="Shows 2" /></td>
</tr>
<tr>
<td></td>
<td>In 10 min</td>
<td>In 20 min</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Shows 3</th>
<th>Shows 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image7" alt="Shows 3" /></td>
<td><img src="image8" alt="Shows 4" /></td>
</tr>
<tr>
<td></td>
<td>In 30 min</td>
<td>In 1 hour</td>
</tr>
</tbody>
</table>

*The Shows en 1h30min*

*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:
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
0,0245X40min=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 $

<table>
<thead>
<tr>
<th>Other expenses</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manpower</td>
<td>1.96</td>
</tr>
<tr>
<td>Electric power</td>
<td>0.0126</td>
</tr>
<tr>
<td>It dilutes</td>
<td>0.002934</td>
</tr>
<tr>
<td>Total</td>
<td>1.98</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>TOTAL COST OF THE PROCESO</th>
<th>CAMISA</th>
<th>PANTALÓN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Products recipe N°4</td>
<td>0,76</td>
<td>0,95</td>
</tr>
<tr>
<td>Other expenses</td>
<td>0,99</td>
<td>0,99</td>
</tr>
<tr>
<td>Total</td>
<td>1,77$</td>
<td>1,94$</td>
</tr>
</tbody>
</table>

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 silicona 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 antibacterial 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 silicona 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 silicona 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.

10. Gratefulness.

My deep gratefulness to the Technical University of the North, institution that offered me the opportunity to be formed professionally.

A sincere gratefulness to the Happy engineer Gualoto to be he guides and to share time and knowledge during this investigation process.

I thank from a special way to the Miss. Susana Ibujes who I offer myself their professional knowledge, giving me a guessed right supervision in the process practices and being from the beginning the guide until the culmination of this work, I also thank to all who were part of this investigation and who deposited their whole trust in me, since without the participation of them, it would not become possible the culmination of this work.
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