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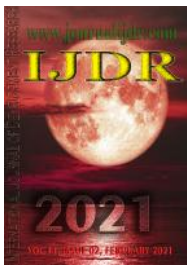

RESEARCH ARTICLE OPEN ACCESS

CHEMISTRY AND ENVIRONMENTAL EDUCATION: EXTRACTION OF NATURAL EXTRACTS FROM THE BRAZILIAN SEMIARID

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ABSTRACT

The insertion of everyday themes in Teaching Chemistry facilitates their contextualization and interdisciplinarity in the study of situations that involve themes related to agriculture and its potentialities. The productive activities in the chemical area are normally risky and potentially cause pollution, since it works with substances that often have toxic properties causing several environmental problems. The present work was developed in a Brazilian public school addressing the knowledge about the semiarid region of Paraiba and its richness in the aspect of chemistry and agriculture, through extraction of natural dyes and their importance for humanity. The extraction of dyes was carried out in an alcoholic medium using different species of flowers from the Brazilian semiarid region, being considered efficient, because when the extracts come into contact with the substances they offer greater distinction in the variation of colors. The synthesis of natural pigments from the semiarid resources of Paraiba was very enriching from the historical, socioeconomic and environmental point of view. During the experimental procedures developed at the school, a constant dialogue can be established between students and the school community, in order to demonstrate that these active teaching methodologies can help in the construction and reconstruction of scientific knowledge.

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INTRODUCTION

Chemistry is a science considered by many citizens, including farmers, difficult to be understood, but as one begins to understand the chemical concepts one observes the beauty of this science (Santos, 2020). Agricultural students consider this discipline particularly difficult to associate with their daily lives. Differentiated activities in Chemistry have been demonstrating that the contents taught in the classroom can be linked to their daily life, in an objective and direct way with field lessons and experiments with low cost materials (Galliazi *et al*., 2001). In this work, we use experimentation as a means to facilitate and promote meaningful learning, in which the farmer student is considered an active individual in the teaching-learning process and his participation is considered fundamental for the development of activities, improving the relationship between teacher and student. Today, it is expected that the study of chemistry will enable the man of the field to develop a critical view of the world around him, being able to analyze, understand and use this knowledge in everyday life, being able to perceive and interfere in situations that contribute to the deterioration or improvement of their quality of life. One of the goals of science education is to provide agricultural students with the ability to construct arguments, reasoning and thinking critically in a scientific context. Over the years, many studies have been conducted on constructing arguments in science teaching, but only few of them have dealt with studying argumentation in the laboratory. Our research focuses on the process in which students construct arguments in the chemistry laboratory while conducting various types of experiments. It was found that inquiry experiments have the potential to serve as an effective platform for formulating arguments, owing to the features of this learning environment. The difficulties faced in surviving in one of the most inhospitable biomes on the planet are enormous, but the variety of alternatives that farmers have developed to ensure a

decent survival in the Brazilian semiarid region is also great. In the semiarid Paraiba we have vegetation very characteristic of the region and we can use its wealth and diversity to encourage the student's farmers in the preservation of this biome. Thus, it is necessary that both teachers and students learn to seek existing knowledge to build new arguments and counter-arguments from it; it is necessary to perceive as agents of knowledge production and their learning (Santos *et al*., 2016). It is also agreed that experimentation is a fundamental activity in teaching science. However, experimentation in the experience of schools is an infrequent activity. Humanity has been making use of natural paints for approximately 5000 years, beginning in the Neolithic period, developing until the present time. The natural dyes have been used from this the times of the cavemen to demonstrate their daily routine, through rock paintings almost always in a red or black tonality. Indians also make use of these pigments in body paintings on both holidays and war days. Natural paints are those that, instead of being made of chemicals, are extracted from elements of nature, that is, from organic compounds made with molecules containing carbon combined with hydrogen and often with oxygen or nitrogen. And, like the others, they are basically composed of pigments and binders, having characteristics of opacity or transparency. They can be made from nuts, barks, roots, fruits, petals, wood shavings, and leaves, parts of flowers and whole plants, insects, earth, among others. The plants are able to provide more than 500 colors (Casulo, 2019; Yoshida *et al*., 2009).

Any type of soil can be used to make paint; the choice will depend on the color and effect sought. Over time natural dyes have been replaced by chemicals. In the year 1856, natural paints began to be produced, as the first artificial coloring was created, causing industries to turn their attention to synthetic dyes. In Brazil, natural dyes have an important relationship with their history, starting with the name of the country, derived from the wood of pau-brazil (*Caesalpiniaechinata*), an important source of red dye in the 16th century. For a long time Brazil was the most precious local product for the portuguese who sold it in Europe for the dyeing of fabrics. The beauty of nature is expressed through the colors of the flowers that come from the acidity or alkalinity of the sap, the Paraiba semiarid has a diversity of flowers of strong color (Santos *et al*., 2005). Discussions about agriculture, field education and the contextualization of chemical education, through themes and the theoretical-methodological axis, constitute a challenge to the area of research in science and chemistry teaching, particularly research that seeks instrumentalism the Teaching of Chemistry to the context of the field committed to the agroecological perspective of agricultural production (Hasan *et al*., 2015; Santos *et al*., 2017). Considering these and other aspects, this research aimed to bring classroom chemistry closer to the daily life of the agricultural students (Movahedi *et al*., 2013), arousing interest in the discipline and the taste for research in the field, besides promoting student motivation, since working with dyes can arouse their curiosity.

MATERIALS AND METHODS

This work was carried out with a group of 80 students of the 2nd year of the Secondary School of a State School of Agriculture located in the semiarid region of the State of Paraiba, Brazil, aiming to help the teacher about the problematization of the agricultural student's reality with the scientific concepts seen in the classroom. Theoretical classes with presentation on the richness of the semiarid and the history of the natural dyes, followed by an ecological trail with the students where the material was collected (Figure 1) that would be used in the experimental process.

Figure 1. Species used in the experiments

The extraction of the dyes was by alcoholic means. According to Khazaei*et al*. (2016) the route of extraction of alcoholic pigments is the most efficient, because when the extracts / indicators come in contact with the substances offer greater distinction in the variation of the colors, soon, this methodology was adopted for the preparation of the extracts. The extraction of the pigments consisted initially in separation by collection and priming. Some species of different flowers were collected to extract pigments of different colors. The experimental part was done in two ways: in the first part the flowers or leaves were placed in a beaker and added 100 mL of ethyl alcohol and allowed to stand still, observing what was happening within 30 minutes. In the second part the material was placed in a pistil mortar, where the petals of the flowers were macerated in water to obtain more efficient pigments (Figure 2). The volume of solvent (water) used was 100 mL for the production of each extract and 25 g of petals. The solid part was separated through the filtration system which was mounted with a universal holder, a ring, funnel and filter paper. After filtration the extracts were obtained. In the second, a questionnaire was applied to the farming students and the learning issues were verified, making them feel part of this process.

Figure 2. Experimental procedure to obtain e extracts

RESULTS AND DISCUSSION

As the experimental work began with a presentation about the semiarid of Paraiba State, Brazil, in the agricultural school with the second year of high school, they suggest several

questions about the topic addressed, leading to the discursive debate, where each student farmer defended his point of view. After the debate, the students were so fascinated with the theme that they suggested working on textual productions about the semiarid. The field class took the form of an ecological trail where the student's farmers collected materials that would be used in the experimental class to obtain the extracts. After the collection the material was separated and distributed according to the coloring of the flowers, stored in a refrigerator, because the experimental class was performed on another day. Students were given a road map of the practice that would be performed by them. In the first part the petals were placed in ethyl alcohol and it was observed that some flowers released the pigments faster than others. When asked why this occurred, students' responses are shown in Figure 3. A discussion was raised about why white flowers do not release pigmentation, making comparisons about the chemical reactions that occur between alcohol and flower petals, where it has been observed that some react faster while others have a very slow process of color extraction.

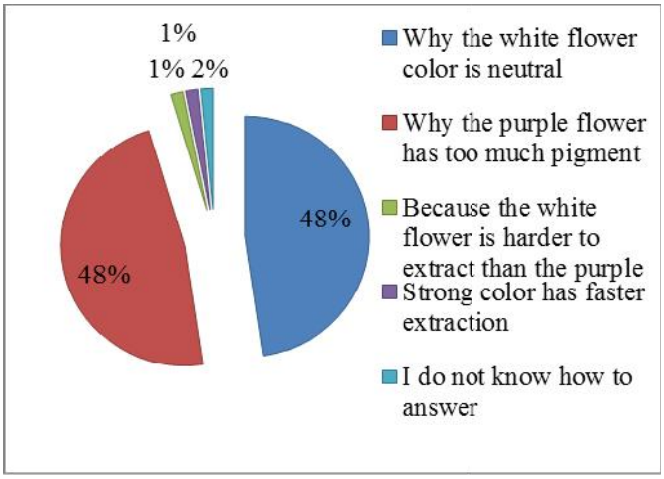

Figure 3. Answers of the question about why when they were placed the white flowers in the alcohol did not fade fast, while the purple flowers the process was fast

In the second part of the experiment the extraction was done by macerating petals of the flowers in water, as soon as the maceration began, it was possible to see the release of the color in a strong and persistent way, how much, but the color became stronger. The solid was then separated from the liquid through the filtration process where the pigment was almost ready to be used. Through the extraction of the natural dyes the farmers students experienced methods of extraction, separation and filtration, obtaining the colored extracts. This experimental practice helped students in the teaching and learning process using alternative and low-cost sources. During the development of this work it was observed that the students are very participative during the activities, leading one to believe that this is possible due to the questionings made previously in the classroom. For Santos and Santos (2020), essentially education is a practice, but a purposeful practice in theory (Demirdöğen*et al*., 2016; Medeiros Filho *et al*., 2020). The acquisition of knowledge by the student takes many forms, but it is believed that the best way to acquire knowledge is to enable the student to leave the condition of passive listener and to carry out activities that allow the construction of knowledge in a participatory, active and dynamics, interacting with the environment, colleagues and the teacher (Santos *et al*., 2016; Santos *et al*., 2019; Santos and Silva, 2019; Silva *et al*., 2016). During the experimental activity developed constant dialogue was established with the students, in the sense of assisting them in the construction and reconstruction of knowledge.

CONCLUSION

With the application of this pedagogical work it can be concluded that the agricultural students felt motivated and interested to be an integral part of the teaching-learning process, which allowed the enrichment of the classes. All stages of the work were performed with the students' success and interest. The production of natural pigments from the semiarid resources of Paraiba was very enriching from the historical, socioeconomic and environmental point of view, aiming to awaken the researcher's side of the farmer by the chemistry of his daily life, although the practice of pigment extraction is easy, requires several concepts of chemistry, such as reactions, filtration and separation of the extracts.

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REFERENCES

Casulo, J. C. (2019). The Objectives of Sustainable Development and the Academy. Science Research, 7 (5): 68-72.

Demirdöğen, B.;Hanuscin, D. L.;Uzuntiryaki-Kondakci, E.; Köseoğlu, F. (2016). Development and nature of preservice chemistry teachers' pedagogical content knowledge for nature of science. Research Science, Education 46 (4): 575-612.

Galiazzi, M. C.; Barros Rocha, J. M.;Schmitz, L. C.;Souza, M. L.;Giesta, S.;Gonçalves,M. P. (2001). Objetivos das atividades experimentais no ensino médio: a pesquisa coletiva como modo de formação de professores de ciências. Ciência e Educação,7 (2): 249-263.

Hasan, S. S.;Turin, M. Z.;Sultana,S. (2015).Bangladeshi Extension Workers Attitude towards Sustainable Agriculture. Academia Journal of Agricultural Research, 3 (11): 312-320.

Khazaei, K. M.; Jafari, S. M.;Ghorbani, M.;Kakhki, A. H.;Sarfarazi,M. (2016).Optimization of anthocyanin extraction from saffron petals with response surface methodology. Food Analysis and Methods, 9 (7): 1993-2001.

Medeiros Filho, F. C.; Santos, J. C. O.;Fonseca, L. L. S. A. (2020). Combating Aedesaegypti in Brazil: An Interdisciplinary Proposal in Teaching Biotechnology Chemical. Biotechnology: AnIndianJournal, 16 (3): 211-217.

Movahedi, R.; Latifi, S.; Sayyar, L. Z. (2013). The factors affecting agricultural students' attitude towards self-employment and entrepreneurship. International Journal Agricultural Crop Science, 5 (16): 1813-1821.

Santos, J. C. O. 2020. Ensino de Química e Educação Ambiental: Estudos de Caso e Relatos de Experiências. Rio de Janeiro: E-Publicar, 180p.

Santos, J. C. O.; E. P.,Santos. (2020). Use of Medicinal Plants of Brazilian Caatinga in a Perspective of Solidarity Economy. International Journal of Environmental and Agriculture Research, 6 (7): 36-42.

Santos, J. C. O.;Costa, A. P.;Araújo, A. L.;Martins, J. S.; Oliveira, L. F. B.;Lima, V. C.;Oliveira, R. J.;Dantas, D. L.;Melo,F. M. A. (2017). The Juazeiro (ZiziphusJoazeiro Mart.) and the Formation of Concepts and Parameters in Chemical Technology Education. Asian Journal of Applied Science, 5 (2): 137-141.

Santos, J. C. O.;Costa, A. P.;Araújo, A. L.;Martins.J. S. (2016). Chemistry and Sustainable Development: The Use of Brazilian Regional Plants in the Context of Chemical Concepts. Academia Journal of Scientific Research, 4 (9): 276-278.

Santos, J. C. O.;Dantas, J. P.;Medeiros, C. A.;Athaíde-Filho, P. F.;Conceição, M. M.;Souza,A. G. (2005). Thermal Analysis in Sustainable Development: Thermoanalytical study of faveleira seeds (CnidoscolusQuercifolius). Journal of Thermal Analysis and Calorimetry, 79 (5): 271–275.

Santos, J. C. O.;Silva,R. J. D.(2019). Chemical educational game: A tool for understanding Organic Chemistry. Academia Journal of Educational Research, 7 (7): 235-241.

Santos,J. C. O.; Santos, F. J. M.; Matias,R. S. (2019). Chemistry and environmental education in relevant disposal of batteries. Academia Journal of Scientific Research, 7 (1): 49-52.

Santos, J. C. O.; Costa, E. O.;Lima, R. C. S.;Araújo, D. S.; Sousa, A. S. (2016). Alternative ways in chemistry teaching: Providing the creativity of high school students. Academia Journal of Educational Research, 4 (4): 069-075.

Silva, A. S.;Santos,J. C. O.;Silva, R. J. D.;Oliveira Junior,J. C. (2016). An Experimental Approach to Chemistry Teaching: Oxygenated Organic Function Identification Tests on Cosmetics. Academia Journal of Scientific Research, 4 (3): 069-074.

Yoshida, K.;Mori, M.;Kondo,T. (2009). Blue flower color development by anthocyanins: from chemical structure to cell physiology. Natural Product Reports, 26 (7): 884-915.

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