IMPACTO CIENTÍFICO EDITORA

FRUIT TREE PROPAGATION PRACTICES: GRAFTING TECHNIQUES, CUTTINGS IN BLACKBERRY, PINEAPPLE AND MANGO CROPS

PRÁTICAS DE PROPAGAÇÃO DE FRUTEIRAS: TÉCNICAS DE ENXERTIA, ESTACAS NAS CULTURAS DE AMORA, ABACAXI E MANGA

PRÁCTICAS DE PROPAGACIÓN DE FRUTALES: TÉCNICAS DE INJERTO, ESQUEJES EN CULTIVOS DE MORA, PIÑA Y MANGO

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ABSTRACT

This paper presents the development of the "Fruit Tree Propagation Practices" project, carried out at the Lagoa da Confusão Campus of the Federal Institute of Tocantins (IFTO). The main objective was to promote the technical training of students through practical plant propagation activities, addressing methods such as breaking dormancy, rooting, sectioning, and grafting fruit plants. The methodology adopted was characterized by a qualitative approach, combining theory and practice, with activities developed in the institution's multipurpose laboratory and nursery, involving students in all stages of the process. The project contributed to the professional development of students, strengthening technical skills, and promoting outreach activities in the external community. The results demonstrated the effectiveness of the techniques applied, highlighting the importance of in-person activities for agricultural education. The initiative reinforces the role of practical education in promoting sustainable development and strengthening agriculture.

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Keywords: Agriculture. Breaking Dormancy. Agricultural Education.

RESUMO

O trabalho apresenta o desenvolvimento do projeto "Práticas de Propagação de Fruteiras" realizado no Campus Lagoa da Confusão do Instituto Federal do Tocantins (IFTO). O objetivo principal foi promover a capacitação técnica de estudantes por meio de atividades práticas de propagação vegetal, abordando métodos como superação de dormência, enraizamento, seccionamento e enxertia de plantas frutíferas. A metodologia adotada caracterizou-se por uma abordagem qualitativa, combinando teoria e prática, com atividades desenvolvidas no laboratório multiuso e viveiro da instituição, envolvendo os estudantes em todas as etapas do processo. O projeto contribuiu para a formação profissional dos discentes, fortalecendo habilidades técnicas, além de promover ações de extensão na comunidade externa. Os resultados demonstraram a eficácia das técnicas aplicadas, evidenciando a importância de atividades presenciais para o ensino agropecuário. A iniciativa reforça o papel da educação prática na promoção do desenvolvimento sustentável e o fortalecimento da agricultura.

Palavras-chave: Agricultura. Superação de Dormência. Educação Agrícola.

RESUMEN

Este artículo presenta el desarrollo del proyecto "Prácticas de Propagación de Frutales", llevado a cabo en el Campus Lagoa da Confusão del Instituto Federal de Tocantins (IFTO). El objetivo principal fue promover la formación técnica de los estudiantes mediante actividades prácticas de propagación de plantas, abordando métodos como la ruptura de la latencia, el enraizamiento, el seccionamiento y el injerto de plantas frutales. La metodología adoptada se caracterizó por un enfoque cualitativo, que combina teoría y práctica, con actividades desarrolladas en el laboratorio multiusos y vivero de la institución, involucrando a los estudiantes en todas las etapas del proceso. El proyecto contribuyó al desarrollo profesional de los estudiantes, fortaleciendo sus habilidades técnicas y promoviendo actividades de divulgación en la comunidad externa. Los resultados demostraron la eficacia de las técnicas aplicadas, destacando la importancia de las actividades presenciales para la educación agrícola. La iniciativa refuerza el papel de la educación práctica en la promoción del desarrollo sostenible y el fortalecimiento de la agricultura.

Palabras clave: Agricultura. Rompiendo la Latencia. Educación Agrícola.

1 INTRODUCTION

Plant propagation is a fundamental practice in agriculture, horticulture and forestry, being responsible for ensuring the multiplication and maintenance of plant species of economic, ecological and ornamental interest. This multiplication can occur sexually, from seeds, or asexually, through the use of vegetative structures such as stems, roots, and leaves (Wilson *et al*., 2011).

Sexual propagation is often used for its simplicity and large-scale viability, although it can result in genetic variability among offspring. On the other hand, vegetative or clonal propagation methods, such as grafting, layering, and cuttings, allow the faithful reproduction of the genetic characteristics of the mother plant, ensuring uniformity, precocity, and greater phytosanitary control (Petri *et al*., 2019; Sahu *et al*., 2024).

In this context, the mastery of vegetative propagation techniques becomes important for professionals and students of agricultural sciences. Familiarity with methods such as stem cutting, layering, and grafting allows the selection of strategies appropriate to each species, taking into account factors such as plant physiology, the type of propagative material, environmental conditions, and the purpose of propagation. In addition, these techniques are essential to ensure the sustainability of production systems, through the production of seedlings with genetic and phytosanitary quality, contributing to the efficiency and success in the implementation of orchards and cultivated areas (Petri *et al.,* 2019; Wilson *et al.,* 2011).

In view of this, the present work aimed to promote a practical workshop on vegetative propagation of fruit plants, aiming to provide participants with the experience of techniques widely used in the agricultural sector. The activity sought to integrate theoretical knowledge with practical application

2 METHODOLOGY

The development of the project involved practical activities aimed at overcoming seed dormancy and application of layering in pine cone (*Annona squamosa*), sectioning of vegetative arts of pineapple (*Ananas comosus*) and blackberry (*Morus nigra*), and germination of mango (*Mangifera indica*) seeds, with the aim of training participants in the propagation techniques of these crops.

This qualitative-quantitative study was conducted through a sequence of practical and theoretical activities with students of the Technical Course in Agriculture and Agronomic Engineering of the Federal Institute of Tocantins - Lagoa da Confusion Campus. The methodological approach was based on a constructivist strategy, promoting the participation

of students in the execution, monitoring and analysis of the techniques of vegetative propagation of fruit trees, integrating theory and practice in a complementary way.

The practical activities began with overcoming the dormancy of pine cone seeds (*Annona* sp.), using the mechanical scarification technique. To this end, the seeds were sanded until the dormancy layer was partially removed (Fachinello *et al*., 2008). After chiseling, the seeds were sown in tubes with sterilized substrate composed of sand and Plantmax substrate, and kept under controlled environment conditions in the nursery, with daily recording of the increase in germination and initial growth. At the same time, the layering technique was applied to pine cone branches, in which girdling was carried out followed by wrapping with moist substrate, packaged and protected with PVC paper, aiming at the induction of adventitious roots for the formation of new seedlings.

For the germination of mango seeds (*Mangifera indica*), the seeds were placed in seedling bags with a high porosity substrate, under conditions of adequate light. The students carried out periodic monitoring, recording the emergence time, germination rate and number of embryos per seed.

In the propagation stage by cuttings, a rooting procedure was carried out on blackberry cuttings (*Rubus* spp.). Apical cuttings were collected, previously treated with rooting hormone powder containing IBA, with a concentration of 1000 mg. L-1, and later inserted into plastic bags containing vermiculite substrate. The method adopted was cuttings, with the maintenance of the cuttings under a wet chamber, obtained by means of transparent plastic bags. The process was monitored for root formation over four weeks, with a record of the rooting percentage and length of the roots formed.

Pineapple stem sectioning was performed using sterile stylets to make precise cuts in order to promote rooting by cuttings. The grafting, budding and layering procedures were conducted according to traditional techniques, with the preparation of open and closed rootstocks, in addition to the union of seedlings and induction of shoots from buds. The results were accompanied by systematic records of survival, growth and development of the grafted plants.

3 RESULTS AND DISCUSSION

During the development of the project, an advance in the technical skills of the students in relation to vegetative propagation practices was observed. In the stage of overcoming dormancy of pine cone seeds (*Annona squamosa* L.), the application of mechanical chiseling resulted in an average germination rate of 75%, with the emergence of the first shoots approximately seven days after planting, showing the efficiency of mechanical chiseling in

overcoming dormancy of recalcitrant seeds, favoring the initial emergence and establishment of seedlings (Menegazzo, 2012). In addition, the insertion of the practice of layering in pine cones (Figure 1) enabled students to understand the importance of this technique for the efficient production of plant species that are difficult to propagate by other means (Mota, 2024).

Figure 1

Application of the layering technique on pine cone branches

Source: The authors

Mango seeds had an average of 80% germination within 14 days after planting, evidencing the good viability of the seeds used, the germination of *Mangifera* sp seeds highlights the importance of factors such as seed quality, storage conditions and substrate for speed and uniformity in germination (De carvalho, 2023). In addition, the identification of specimens with polyembryony shows the occurrence of multiple embryos per seed, a phenomenon that may represent an advantage for vegetative propagation and increase in the number of seedlings obtained from viable seeds. The presence of polyembryony also suggests potential for future studies on genotype selection and clonal propagation, considering that these multiple embryos may have identical genetic characteristics to the mother individual, favoring the maintenance of desirable characteristics (Paixão, 2022).

Figure 2

Polyembryony practice and overcoming dormancy

Source: The authors

During the activities of vegetative propagation by mulberry cuttings, the cutting rooting method demonstrated a success rate of approximately 65%, with roots well developed in about three weeks after the installation of the cuttings under high humidity environment (Figure 3). During the activity, the students learned how to apply rooting hormones and how to properly manage humidity and lighting, essential factors for the efficiency of propagation.

Figure 3

Blackberry seedlings rooted three weeks after cuttings

Source: The authors

In the pineapple stem sectioning phase, seedlings were produced that presented a survival rate of 70% until the stage of vegetative seedlings ready for planting. The techniques of cutting, preparation of plant material and environmental management were improved by

the students. In the grafting technique, different plant species were successfully united, establishing a survival rate of approximately 85%, with favorable initial development in the grafted plants. These results demonstrated the effectiveness of the methods employed and provided students with a practical experience of very high applicability in the productive sector.

All seedlings produced throughout the project were donated through SICTEG (Gurupi Integrated Week of Science and Technology), strengthening the link between academic actions and the local community, promoting sustainability and encouraging the expansion of fruit production in the region (Figure 4).

Figure 4

Distribution of seedlings to the visiting public of the Gurupi Integrated Week of Science and Technology

Source: The authors

4 FINAL CONSIDERATIONS

The development of the project proved to be an initiative of important pedagogical, technical and social value, contributing to the integral formation of the students. The integration between theory and practice provided students with an enriching experience, allowing them to apply the knowledge acquired in the classroom in concrete activities of management, propagation and conservation of different fruit species.

The donation of the seedlings produced to SICTEG not only reinforces the project's commitment to the local community, but also promotes regional agricultural development, encouraging the transfer of technical knowledge to farmers and small producers, and strengthening sustainable agriculture practices. In addition, the project played an important role in the recovery and resumption of face-to-face activities for the consolidation of the practical training of students and for the strengthening of the bond between the institution and

the community, especially in the context of the restrictions imposed by the COVID-19 pandemic.

By stimulating student engagement in social, environmental and educational actions, the project contributed to the development of transversal skills, such as teamwork, social responsibility, planning and problem-solving skills. In this way, it is evident that the initiative not only fulfills its academic role, but also promotes positive and lasting impacts on the community and on the professional training of students.

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