Thinking and Improvement of Plant Tissue Culture Course and Experimental Training Teaching

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Abstract. In this paper, the plant tissue culture and experimental training teaching were improved scientifically and rationally, and the experimental training teaching mode of "full contact in the experimental process" was established, which achieved good teaching effect and improved students' comprehensive ability and employment competitiveness.

Keywords: Plant tissue culture; Experimental training teaching; Science; Reasonable; Ability.

1. Introduction

Plant tissue culture is an important part of modern biotechnology, and it has been widely used in scientific research and production practice. In practice, such as rapid propagation, detoxification, breeding, factory production of medicinal plants and conservation of germplasm resources, it has achieved great economic and social benefits. In scientific research, plant tissue culture is one of the important basic technologies in plant cell engineering, genetics, plant physiology, biochemistry and molecular biology.

Plant tissue culture is a professional course of biotechnology and related majors, and it is a technical course with strong practicality and application. Therefore, the experimental training of plant tissue culture has become the center and key link of teaching. In recent years, colleges and universities pay more and more attention to the experimental training teaching of plant tissue culture, strengthen the training of basic experimental skills, and cultivate students' hands-on ability and the ability to analyze and solve problems, so as to increase graduates' employment competitiveness [2-3].

Based on several years of teaching practice, this paper summarizes the following teaching experiences and improvement measures:

2. Scientific and reasonable teaching

2.1 Reasonably set the class time

Plant tissue culture course and experimental teaching should be offered in the next semester of each academic year, that is, from February to July. There are three reasons: First of all, this time period is the season when all kinds of plant organs begin to grow vigorously, especially the explants taken in spring, and the callus rate, differentiation rate and survival rate are relatively high. However, in autumn and winter, plant materials tend to be aging or dormant (such as dormant buds), and explants will be slow or unresponsive to induction. Secondly, the explants taken in spring will save more energy in the process of cultivation. With the change of seasons and the rise of temperature, in the condition management of differentiation culture and rooting culture, the requirements of plants for temperature and light are closer to those of nature at that time. In this way, the time for supplementing illumination by fluorescent lamps and the use of air conditioners and electric heaters are reduced, thus saving a lot of energy. Thirdly, the explants taken in spring are easier to cultivate, and the cultivation effect is better, which brings great confidence and sense of accomplishment to students. For students, the value of this confidence and sense of accomplishment is higher than the success of the experiment itself.

2.2 Scientifically optimize the teaching system

Based on the latest textbooks of plant tissue culture at home and abroad, the knowledge of this course includes the basic knowledge and technical essentials of plant tissue culture, such as overview

of plant tissue culture, basic operation techniques of plant tissue culture, cultivation methods of plant tissues and organs, rapid propagation techniques of plant detoxification, haploid culture, cell culture, plant protoplast culture and cell fusion, in vitro conservation of germplasm resources, plant genetic transformation, factory production and management techniques of plant tissue culture seedlings, and economic plant tissue culture methods.

The course of plant tissue culture mainly includes four modules, that is, basic operation techniques of plant tissue culture, derivative techniques, factory production and management, and economic plant tissue culture methods. Among them, the basic operation technology of plant tissue culture belongs to basic theory and basic skills, which play a supporting role in three modules: biotechnology skills related to the basic technology of plant tissue culture, industrial production and management, and specific operation methods of economic plant tissue culture. Therefore, in the teaching process, we should pay more attention to the explanation of the basic operation technology of plant tissue culture, and use video to assist teaching, so that students can have an intuitive and perceptual cognition of theoretical knowledge, and arouse students' interest in experimental and practical operation through video.

Examples should be introduced into the explanation of various technologies derived from basic technologies, especially various phenomena related to tissue culture that are common in life. For example, the stem segment culture in the chapter of plant tissue and organ culture can be compared with the rose cutting in gardening and greening. In this way, students not only deepen their understanding of basic operation techniques, but also have a general image recognition of the cultivation of stem segments in the tissue culture laboratory, which lays a good foundation for the smooth progress of experimental training.

2.3 Strengthen the effect of experimental training

2.3.1 Attach great importance to the continuity of experimental training

The experimental training of plant tissue culture has strong continuity. The basic operation technology of plant tissue culture is a complete technical system. Although each link can be used as an experimental training content alone, the cultivation of seedlings of each explant can not be separated from the continuous progress of each link. Therefore, in the course of experimental training, we must pay attention to its continuity.

Based on this, we closely combined with the teaching of basic operation techniques in the first chapter of theoretical courses, arranged basic experimental operations in a timely manner, and completed the whole process of basic operation techniques in plant tissue culture. That is, the preparation of mother liquor of culture medium, the preparation and sterilization of culture medium, the disinfection and inoculation of culture materials, the transfer and differentiation culture of callus, rooting culture, domestication and transplanting, etc.

2.3.2 Key nodes of intensive training

According to the experimental technical points, the training contents of plant tissue culture experiment can be divided into four parts: preparation of culture medium, treatment of explants, disinfection and inoculation, cultivation of explants and intermediate propagules, and domestication and transplantation. Based on the curriculum characteristics of higher vocational colleges, according to the requirements of the syllabus and employment needs, the preparation of training medium and the treatment, disinfection and inoculation of explants should be strengthened in the laboratory to improve students' independent operation ability and employment competitiveness.

The preparation of culture medium includes preparation of mother liquor, preparation and sterilization of culture medium. Several basic culture media such as MS, N6 and white are selected for students to practice many times. First of all, we must cooperate with students to carefully calculate the amount of various solutes needed for each mother liquor, and weigh them according to the amount. This is an easy-to-ignore link in teaching, because teachers usually think that students have this ability, but there is always the phenomenon of mother liquor mismatch in the experimental process. If this

phenomenon is not found in time, it will lead to idling of all subsequent experimental links, and finally it is difficult to get the expected experimental results. Secondly, strengthen the training of students to correctly use the autoclave to sterilize the culture medium. This is one of the basic skills of plant tissue culture experiment, which must be mastered skillfully. If the autoclave is used improperly, it will not only easily affect the sterilization effect of the autoclave itself, but also damage some mechanical parts of the autoclave, and it will bring various potential safety hazards to operators. Therefore, the sterilization process requires not only intensive training and proficiency of students, but also full-time supervision and guidance of teachers to ensure safety.

The experimental focus of explant treatment, disinfection and inoculation is the inoculation process on the ultra-clean workbench. This process requires high sterility and strong skills, which requires repeated intensive training. First of all, when designing experiments, inoculation operations can be designed for various organs such as roots, stems, leaves, flowers, fruits and seeds according to the culture contents of various plant tissues and organs. Secondly, teachers' "teaching, helping and training" are needed in the training process. Teachers teach the key points of skills, and make students basically understand the key points of operation and matters needing attention in the vaccination process through videos and demonstrations. Teachers help to solve problems in operation, such as correcting improper operation, reminding matters needing attention at all times, etc. This requires teachers and students to enter the sterile operation room together, track the whole experiment, guide the experiment and answer questions at any time. Teachers train students with good skills to guide students who are not skilled in operation, so as to achieve the goal of cooperative learning and common progress.

3. Full contact during the experiment

3.1 Experimental project responsibility system

Many courses of biology are inseparable from experiments, through which students can verify, explore and discover. Therefore, students' participation in the experiment should be continuously improved. Therefore, the experimental responsibility system comes into being from time to time. The specific measures are as follows: Divide the classes into four groups, and each experimental group is responsible for an experiment of the course, including the preparation of the experimental class, the explanation of the experiment and the smooth progress of the experimental class (including the management of the training room). Teachers will assist and guide students to solve specific problems anytime and anywhere.

Pre-class preparation refers to the preparation of experimental materials, drugs (types and quantities) and instruments and equipment used in the experimental process in advance according to the experimental requirements. To complete this preparation, the members of the experimental team need to know the whole experimental process first. In this way, students' understanding of the experiment is better than preview. At the same time, through the preparation of the experiment, the students realized the teacher's hard work on weekdays, enhanced the feelings of teachers and students, and achieved the goal of emotional education.

The experimental explanation is a good opportunity for students. It not only trains students' self-study ability and language expression ability, but also strengthens students' courage to speak in front of everyone. After the students explain the experiment, the teacher will supplement and emphasize the explanation content and evaluate the explanation situation, so that the students can understand their own advantages and disadvantages in the explanation process, and further improve themselves.

The smooth progress of the experiment class requires the members of the experiment team to solve all kinds of problems that students have in the experiment process at any time while completing their own experiments. This task is demanding. When you encounter difficulties, you can always ask for help from teachers to guide and solve them.

In recent years, the experimental responsibility system has achieved good results, which not only enhances students' sense of responsibility, but also enhances students' initiative by their active participation.

3.2 Self observation of experimental phenomena to improve the ability of problem analysis and solution

The experimental training of plant tissue culture is continuous, and the cultivation of each material can not be completed in a week or two. In addition to the culture materials that enter the culture room after inoculation, students need to take good care of them, and all kinds of experimental phenomena (such as pollution, whitening, browning, not growing as expected, etc.) that may occur during the culture process need to be analyzed and solved by everyone. Example: Generally speaking, the contamination rate of the initial inoculated materials is relatively high. This is because students haven't mastered many aseptic operation links in material processing and inoculation, and they haven't operated strictly according to the requirements. After analyzing this phenomenon, students will be more careful and operate more strictly in the next inoculation experiment and training.

3.3 Write experimental records and reports scientifically, and pay attention to ability training

General course experiments only require students to make an experimental report on the experiment, while the experiment of plant tissue culture requires frequent observation and detailed records because of its long cultivation time and many problems and phenomena in the experiment and cultivation process. For example, the time and volume of medium preparation, the time, type and quantity of inoculation, the daily culture temperature, humidity and the growth of materials need to be recorded in detail. Because every bit of this experimental record may provide a strong basis for us to analyze and solve any problem that occurs in the experimental process. Through such experimental records and combining them to analyze and solve problems, students will not only improve their ability to analyze and solve problems, but also gradually develop a scientific and rigorous working attitude.

The writing of experimental report should pay attention to the analysis of experimental results and the summary of experiments. The analysis of the experimental results makes students have a clearer understanding of the principles and phenomena of the experiment. Experiment summary, that is, summarize the success and failure of the experiment and analyze it. This is a link to improve students' comprehensive ability. Because doing this well requires students to master the whole experimental process, including experimental operation, analysis of experimental results, analysis of phenomena in the experimental process and solution of problems. This process cultivates students' practical ability, ability to analyze and solve problems, and ability to summarize problems. When students can finish the experimental summary well, the ability goal has been achieved.

3.4 Set up interest groups to participate in Teachers' scientific research

After several experiments arranged in the course, the students have mastered the basic operation techniques, and in the experimental results, they can see that the small materials cultivated by themselves can produce callus and differentiate into seedlings. This kind of joy and accomplishment is hard to express in words. Therefore, the students who have the spare capacity to learn began their own interest journey-setting up an interest group for plant tissue cultivation, designing new experiments according to their own ideas and interests and gradually completing them. In this way, students' initiative and enthusiasm have been mobilized, and the experiment is no longer a curriculum task, but something that students are strongly willing to do. The teaching and experimental effects are self-evident. At the same time, we also encourage these students to actively participate in Teachers' scientific research practice, and gradually improve students' organizational ability and scientific research ability. For example, many students participate in the project of "Wheat Anther Culture" every year. They not only systematically understand the specific process of wheat haploid breeding, but also further strengthen their basic technical skills of plant tissue culture, accumulate

relevant scientific research experience, and lay a good foundation for employment or further study after graduation.

4. Conclusions

In recent years, through the implementation of the above teaching experience in the process of plant tissue culture and experimental training, the effect is good. Students have been systematically trained in various technical links in just one semester, and they can master the basic operation techniques of plant tissue culture, and have certain scientific research ability, which has laid a solid foundation for their future study and work, and the teaching effect is good. With the accumulation of teaching experience and the improvement of experimental teaching conditions, we believe that the experimental teaching quality of plant tissue culture course will be further improved.

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