Practice and Application of Inquiry Teaching in Secondary Vocational Pharmaceutical Specialty

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Abstract: Experimental teaching through teachers to guide students to explore the optimal distillation time of artemisia oil, gradient design of problems, and finally guide students to solve problems in order to achieve the purpose of the experiment. In this process, it effectively helps secondary vocational school students to improve their learning enthusiasm, and implements the training goal of students becoming the main body of the classroom, actively discovering problems, and solving problems by themselves. At the same time, it also provides a new teaching method and means for front-line secondary vocational school teachers.

1. Introduction

In recent years, with the rapid development of biopharmaceuticals, half of the world's pharmaceuticals have come from biosynthesis. The biopharmaceutical industry has broad prospects, but there is a serious shortage of talents engaged in the biopharmaceutical industry. In order to meet the needs of pharmaceutical technology front-line talents in the pharmaceutical industry, some secondary vocational colleges have set up bio-pharmaceutical majors, which aims to train technical talents in the field of pharmaceutical marketing and primary processing[1]. However, biopharmaceutical is a practical discipline, the traditional teaching method of emphasizing theory over practice can no longer meet its teaching requirements, and the agreement between practical teaching and production technology is low, which leads to the simultaneous decline of students' occupation and employability, even if they are forced to obtain employment and the mature period of professional skills is long, which finally leads to low professional competitiveness[2] .

In order to solve the above problems, the author takes the experiment of “optimal distillation time of Artemisia annua volatile oil” as the practical teaching content. on the one hand, it can enhance students' interest in bio-pharmaceutical courses and let students through the reality of life. master the original boring instrument use, distillation principle, distillation technology and other related theoretical knowledge and practical skills, enhance the interest of learning. So as to create good experimental skills and professional accomplishment. On the other hand, the experiment of “the optimal distillation time of volatile oil of Artemisia annua” takes Artemisia annua as raw material, which is green, environmentally friendly and easy to obtain, and exploring the optimal distillation time of volatile oil of Artemisia annua can greatly improve the utilization rate of Artemisia annua. It is in line with the background of environmental protection and energy saving, which is conducive to the cultivation and shaping of students' emotional values. The volatile oil extracted by experiment has strong aromatic smell and has pharmacological effects such as antibacterial, antiasthma tic, antipyretic, antitussive[3] and so on. Through the combination of education and practice, the teaching concept of “learning by doing” can be thoroughly implemented in secondary vocational classroom. it can not only stimulate students' interest in biological experiments, but also improve students' sense of self-efficacy.

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2. Experimental Teaching Design

2.1 Teaching Design Basis

The core task of secondary vocational schools is to train practical skilled personnel who serve the social and economic development and the needs of the market. therefore, practical teaching is of great significance in secondary vocational teaching. In this experimental teaching, the direct distillation method is used to compare and consider the difficulty of the equipment and operation. on the premise of ensuring the output and effectively reducing the cost, the optimum time of distilling Artemisia annua volatile oil can be obtained through the experiment. the utilization rate of Artemisia annua was greatly improved. In addition, through the targeted training of the experimental skills of the students of related majors, the students' ability to study problems and the ability to closely combine the knowledge they have learned with the reality of life can be integrated with modular training, and the goal of cultivating professional literacy has been implemented. so as to improve the employment competitiveness of students and highlight the goal of vocational education to train high-quality workers and skilled talents with innovative spirit in the front line of vocational education.

2.2 Teaching Group Design

On the premise of ensuring the smooth progress of the experiment, every student is required to actively participate in the experiment. The students are divided into five groups, and the experimental time is set to five gradients before the class. Each group carries out different time gradient experiments. The distillation time of the first to the fifth group is 200min, 250min, 300min, 350min and 400min respectively. A group leader is selected in each group, the responsibility system of the group leader is implemented, and the members of the group work together to complete the experimental task.

2.3 Experimental Process Design

(1) Situation introduction.

The teacher played a short video of the research and development of artemisinin experiment to guide the students to watch, leading to the teaching theme of this class-the extraction of artemisinin oil.

Ask the question: We use distillation to extract the volatile oil of Artemisia annua. Have you ever thought about the circumstances under which we can extract the most artemisia oil? Is it better to distill as long as possible? What is the optimum distillation temperature? In line with the principle of maximizing the extraction rate, the teacher informed the students of the optimum material-water ratio and asked the students to explore the optimal time, then compared the extraction rate of each group, and finally made a group report and discussion.

(2) Probe into the group experiment.

The experimental device is composed of temperature regulating electric heating sleeve, round bottom flask, volatile oil extractor, condensation tube, two plastic hoses, iron frame platform, etc., which instructs the demonstration students to install the instrument from bottom to top. The iron platform should be parallel to the ground, and the axis of the complete set of devices should be perpendicular to the desktop whether viewed from the front or side. As shown in figure 1.

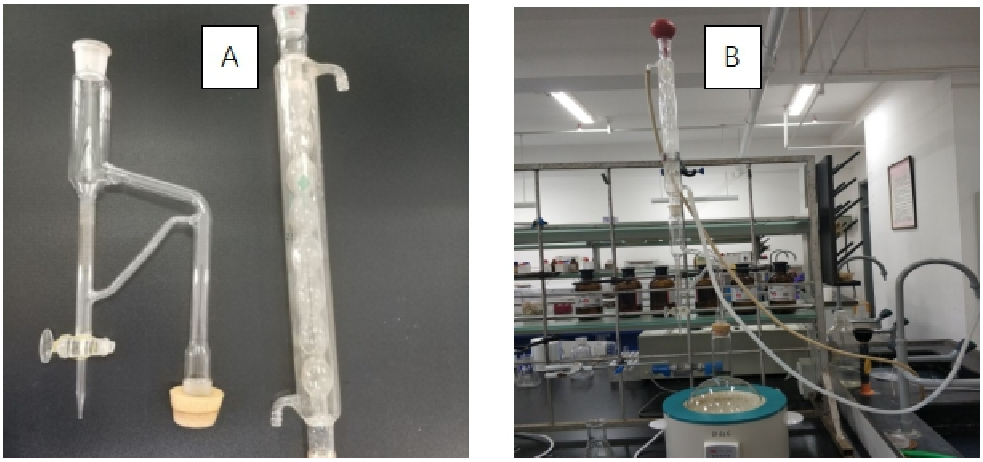

Fig.1 Experimental Device.

(A: volatile oil extractor, condensation tube; B: experimental device)

The experimental process is shown in figure 2, which mainly consists of two parts: the first part is the distillation of Artemisia annua volatile oil, and the second part is the dehydration of volatile oil.

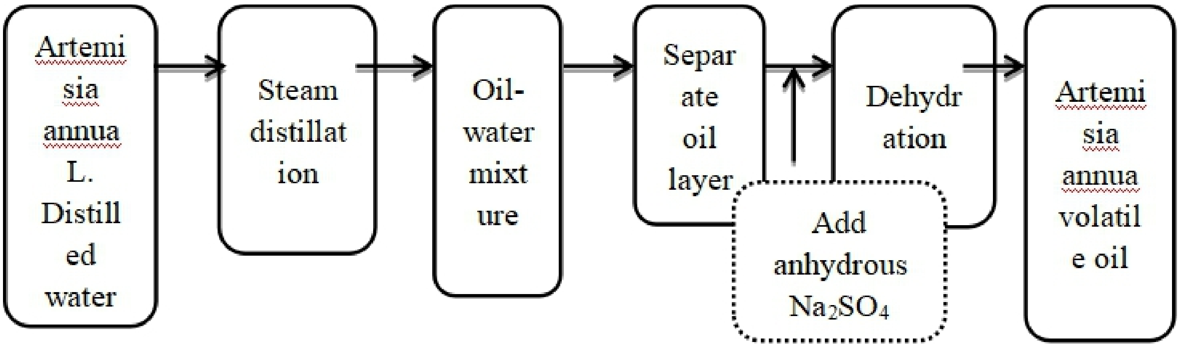

Fig.2 Experiment Flow Chart

Each member of the group seriously discussed and analyzed the experimental process of Artemisia annua volatile oil and worked together. The experiment is carried out strictly according to the issued experimental report. (Take Group 1 as an example).

Group 1: Deal with and weigh Artemisia annua, weigh 100 g Artemisia annua (remove thick branches) and pour into a round bottom flask.

Group 2: Connect the experimental device as required, and then check the air tightness of the experimental device.

Group 3: According to the feed-water ratio of 1:7:4 [4], 740 mL distilled water was measured with a measuring cylinder and poured slowly along the wall of the round bottom flask to mix well.

Group 4: Responsible for power switch, adjust gear, control time.

Group 5: Record the amount of oil according to the time requirements, record the reading of the extractor, open the valve of the volatile oil extractor and slowly release the lower water to 5 mm above the scale line at the upper end of the oil layer. Place it for more than 1 hour, open the piston, and read the amount of volatile oil when the upper end of the oil layer is flush with the zero-scale line. Collect the volatile oil in a sealed brown glass bottle and store it in a refrigerator at 4 ℃.

Group 6: Clean the experimental bench, disassemble and organize the experimental equipment.

Other groups are the same, only need to control different distillation time, so as to save time and improve the efficiency of the experiment. In the course of the experiment, the teacher kept a strict watch, reminded him at any time, checked the experimental progress of each group, and gave guidance to the groups with problems.

(3) Class summary.

The teacher summarizes the performance of the students in this class and points out their problems. First of all, give positive encouragement, and then explain the problem. The results of five groups of parallel experiments are shown in Table 1.

3. Experimental Teaching Achievements

Experimental results 1: Extraction of volatile oil

Table 1 Experimental Results Of Five Groups of Volatile Oil Extraction

Group Member	Distillation time	Volatile oil quality (g)	Oil yield (%)
1	200min	0.58	0.58
2	250min	0.65	0.65
3	300min	0.70	0.70
4	350min	0.59	0.59
5	400min	0.60	0.60
Mean ±standard deviation		0.624±0.050	

Experimental results 2: dehydration of volatile oil.

The results before and after dehydration of volatile oil with anhydrous Na_2SO_4 are shown in figure 3. It can be seen from figure 3 that the crude extract of Artemisia annua essential oil is golden and transparent after dehydration and centrifugation with anhydrous Na_2SO_4, which has the unique smell of Artemisia annua.

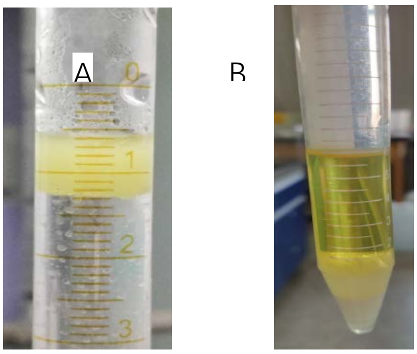

Fig.3 Dehydration and Drying of Volatile Oil.

(A: Before dehydration; B: After dehydration)

At the end of the experiment, the students in each group collated and analyzed the experimental data, compared and communicated with each other, and finally the teacher made a summary and comments. The whole experimental process is relatively simple, as long as strictly follow the operating steps to carry out the experiment. The students think seriously about the problems in their own group and start a discussion. As can be seen from Table 1, the oil production rates of the first group, the second group and the third group are 0.58%, 0.65% and 0.70%, respectively. Other conditions are the same. With the increase of distillation time, the oil production rate of the fourth and fifth groups is 0.59% and 0.60% respectively compared with that of the third group, but the oil yield is decreased. Under the same other conditions, the oil production rate of the fourth group and the fifth group is 0.59% and 0.60% respectively compared with that of the third group. With the increase of distillation time, the oil yield increases until the time reaches 300 minutes, and the oil yield decreases with the increase of distillation time. So, it is concluded that the best distillation time of Artemisia annua volatile oil is 300min. It accords with the theoretical optimum distillation time, and this conclusion is also verified.

4. Conclusion

Cultivating students' scientific inquiry literacy is the requirement and criterion of the new curriculum standard, and the bio-pharmaceutical technology experiment based on hands-on operation is an important way to implement the core literacy of biology. Based on the extraction technology of volatile oil from Artemisia annua, and on the basis of preliminary understanding of distillation principle, this experiment mastered distillation technology through experimental operation to stimulate students' interest in biopharmaceutical technology. it also lays the foundation for the follow-up application course of biotechnology. The traditional experimental teaching is mainly based on teachers' demonstration, which is not conducive to the formation of students' practical ability. This teaching design focuses on project-based inquiry and cooperative learning, giving full play to students' subjective initiative, which not only implements the teaching concept of student-oriented, teaching and learning, but also provides a new means for shaping the emotional values of secondary vocational school students. Hope to help the majority of front-line teachers.

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