No.: 62/NAMCSSTC/IV/2021

Date: 20th of April, 2021

Programme Activity Report: Online Training Course on Horticulture Seed Propagation with Tissue Culture, 22nd – 26th of March, 2021 and 1st of April, 2021

List of Trainers/Facilitators (*alphabetically sorted*):

Abd. Rohim, S.P., M.P.

Abd. Rohim has received several training sessions on the field of quality management system for training facilities and seeding. He is an Associate Expert Lecture at the Ministry of Agriculture of the Republic of Indonesia (MoA)'s Indonesian Centre Agricultural Training-Lembang. In various international activities, he has been an international speaker for the training of farmer's trainers, for the tissue cultural training, for the workshop on added value and the dispatch of experts to the Philippines, Taiwan and Uzbekistan.

Bustanul Arifin Caya

Bustanul Arifin Caya has over three years of experience in leading units in the MoA. He has development management and technology expertise. He has significant leadership experience in agricultural equipment, machinery and agriculture training. He is the Director of the Centre for Agricultural Training of Indonesia. The area of work in which he is interested is Linear Programme Engineering.

Fiadini Putri, M.Sc.

Fiadini Putri has more than ten years' experience in training and teaching human resources working in agriculture. She is an agronomist and horticultural specialist. She has extensive professional experience in horticulture, global trends, research, inorganic nutrients and secondary metabolites of plants. She trains in acclimatisation as part of tissue culture technology.

Sani Hanifah, SP., MP.

Sani Hanifah has over 15 years of experience in training and teaching agricultural human resources. She is an agronomist. She has extensive professional experience in horticulture and tissue culture. As part of tissue culture technology, she trains in tissue culture media.

List of Countries (*alphabetically sorted*):

No	Country	Number of Person(s)
1.	Bangladesh	1
2.	Fiji	5
3.	Indonesia	11
4.	Lebanon	1
5.	Nepal	1
6.	Pakistan	1
7.	Solomon Islands	19
8.	Vietnam	2
	Total	41

Distribution of Participants' Background

No	Background	Percentage
1.	Government	85.37%
2.	Higher education institution	12.20%
3.	Private sector	2.44%

Programme Activity Report

Online Training Course on Horticulture Seed Propagation with Tissue Culture, 22nd – 26th of March, 2021 and 1st of April, 2021

Background

On 22nd – 26th of March and 1st of April 2021, the Non-Aligned Movement Centre for South-South Technical Cooperation (NAM CSSTC), in collaboration with the Directorate of Technical Cooperation of the Ministry of Foreign Affairs and the Lembang Agricultural Training Centre of the Ministry of Agriculture-Republic of Indonesia hold "Online Training Course on Horticulture Seed Propagation with Tissue Culture."

Tissue culture is a means of vegetative propagation of sterile artificial media in a controlled environment by culturing cells, organs or plant parts.

The "Online Training Course on Horticulture Seed Propagation with Tissue Culture" (the "Training") focuses on tissue culture definition, fundamental culture theory, the strengths and disadvantages of tissue culture, a tissue culture lab, phases of tissue culture, culture media, and growth.

Experts from the Training Centre in the area of tissue culture media, results of tissue culture explant management and acclimatisation were present at the virtual training. A variety of digital methods, including e-learning, video conferencing and video streaming were used to provide training.

The trainings included numbers of bureaucrats, extension workers, scientists, and agro-business actors from Bangladesh, Fiji, Indonesia, Lebanon, Nepal, Pakistan, Solomon Islands and Vietnam.

Participants are able to gain knowledge and experience in the following: i) the definition of tissue culture; ii) the theory of the basic tissue culture; iii) the explanation of pros and cons of tissue culture; iv) the description of the tissue culture laboratory; v) a description of phases of tissue culture; vi) tissue culture restrictions and problems; vii) a description of tissue culture media.

Discussion

Advantages of Tissue Culture

There are many advantages of tissue culture, particularly if the plant has mother plants' special character. It makes sure the plantation is like the mother plant of a special variety. The tissue culture is also free of bacteria and viruses. It does not depend on the season, either. A lot of seedlings can also be produced with fast time. Seedlings are cheaper and easier to transport than conventional seedlings.

It is also useful if the variety is resistant to pest and disease, because people can build the selection media. They can maneuver the media to determine which variety to survive in a drought. Secondary metabolites can also be used.

Tissue cultured plants sometimes grow faster, more quickly and fruit more quickly. For example, for bananas, normal plants need more time to produce fruits. But in tissue culture, the growth is faster because the seedlings complete all phases of their growth.

The fruit will also be exact with mother plants.

Laboratory Setting for Tissue Culture

Building infrastructure before setting up a laboratory for tissue culture is necessary and the trainers are invited to develop the technicalities required for the use of the laboratory. The trainers are involved in setting up the lab.

As people work in an aseptic condition, they must ensure the tools and personnel are in a sterile condition. They have to clean themselves and wear gloves after coming from the garden.

The incubation area in the laboratory has a high humidity. People have to ensure that bacteria or fungi do not grow from high temperature. To control humidity, they are using air conditioning.

Air conditioner is required for the tissue culture laboratory. It is difficult to replace. People have to ensure that the plant grows in an aseptic environment. They also need electricity constantly to make the air conditioner keeps operating.

However, some farmers also have a simple lab. The laminar airflow is simple, in a form of *entkas*. Farmers can grow their culture in the *entkas* made out of acrylic. This method is often used for orchid.

Types of Plants

In theory, all plants can be used in tissue culture. However, the economic value of the plants also needs to be considered. There are also differences, especially for the method of sterilisation. Explant sterilisation on banana, requires longer time, greater sterilisation material, than orchid and potato explants because explant bananas are in direct soil contact. Therefore, a lot of pollutant source.

Whereas potatoes are different because they are cleaner and grow over the ground. Some plants have not yet found the method for the tissue culture because different features are possible, for example, like forestry plants. But the tissue culture is open for development.

Tissue Culture Media

Meristem is part of plant appropriate to the tissue culture media technique. For strawberry *sapline*, the auxiliary buds are the plant part that is used.

Meristem could be treated with antiseptic or povidone iodine, especially for banana explants. People use it to prevent contamination before cutting the meristematic tissue. Explant does not need to be washed with water when it is treated with iodine.

On orchid, people just spray the sterilisation material onto the skin of orchid fruit. Iodine, bactericide or fungicide are never used. People just use 70% alcohol. The alcohol use, including in the explants, is a common sterilisation solution.

There are approximately 10 explants in the cultivation bottle, while the bottle is about 20ml in volume. But people have to take the media into account, and must re-subculture in a different bottle if it is too dense.

Media for tissue culture can be generated from instant media like *Muroshige* or Potato Dextrose Agar. The instant media allows people to purchase a single material. For an alternative of instant media, people can use macro and micro-elements. This method is cheaper than purchasing instant media.

The pH of the media is linked to the nutrient availability. Some plantlets do not have proper amount of nutrient. This is why adjusting the pH level is important. For media pH solutions, if the pH is less than 5.8 sodium hydroxide can be added. But people should add hydrochloric acid if the pH is over 5.8.

Rubber and aluminium foil can be used to cover a stock solution bottle. Aluminium protects stock from lights.

Once the whole procedures are taken, a week's wait is necessary to verify whether the media is contaminated by bacteria or fungus.

Moving the Plant to the Field

When planting, people need to be careful. They must make sure that the seedling is also clean when removed from the bottle beforehand. They must ensure that no root contaminants are present. The plants must be trained before they are moved to the field, and people must do so gradually. Fungicide is used to sterilise the plantlet to anticipate the fungal attack before planting.

If people did not succeed in the acclimatisation, they would not have seed to plant. Plants are very sensitive, and even moisture can influence their condition. The instruments must be clean and all instruments must first be sterilised.

Evaluation

By the end of the event, 21 random participants attended survey by the organisers. Survey results are as follows (*vide* Chart 1):

- 88% of respondents said the curriculum was clearly specified;
- 87% of respondents said the organisers facilitated contact between participants;
- 83.33% of respondents said the training was attentive to participants' needs;
- 88% of respondents said the training contributed to their education, professional and personal growth;
- 88% of respondents said the contents were well arranged and easy to follow;
- 87% of respondents said the training kept them engaged and interested;
- 89.29% of respondents said the trainers were familiar with the topics of training;
- 91.67% of respondents said the trainers were well prepared;
- 87% of respondents said the activities related to the goals of training;
- 78.57% of respondents said the training time allocation was enough; and
- 85.71% of respondents said the management of the Zoom Webinar was convenient.

Based on the above results, 86.69% respondents found that the training was very impressive.

Conclusion

Throughout the organisation of the training, the organisers draw these conclusions:

- Participants obtained knowledge and skills on tissue culture definition, fundamental culture theory, the strengths and disadvantages of tissue culture, design of tissue culture lab, phases of tissue culture, culture media and growth.
- Meristem or the auxiliary part of plant is appropriate to the tissue culture media technique.
- Media for tissue culture can be generated from instant media like *Muroshige* or Potato Dextrose Agar.

====

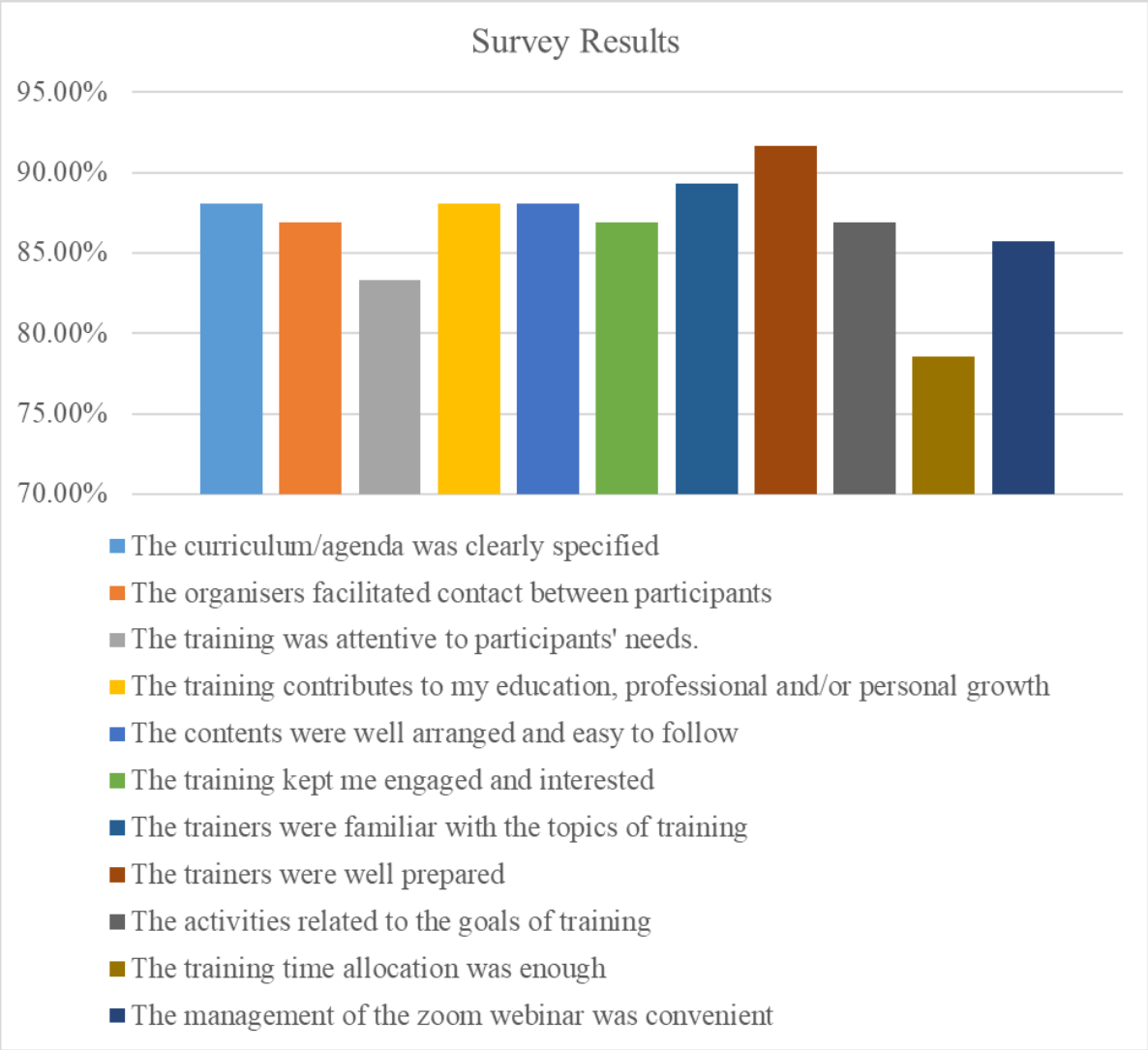
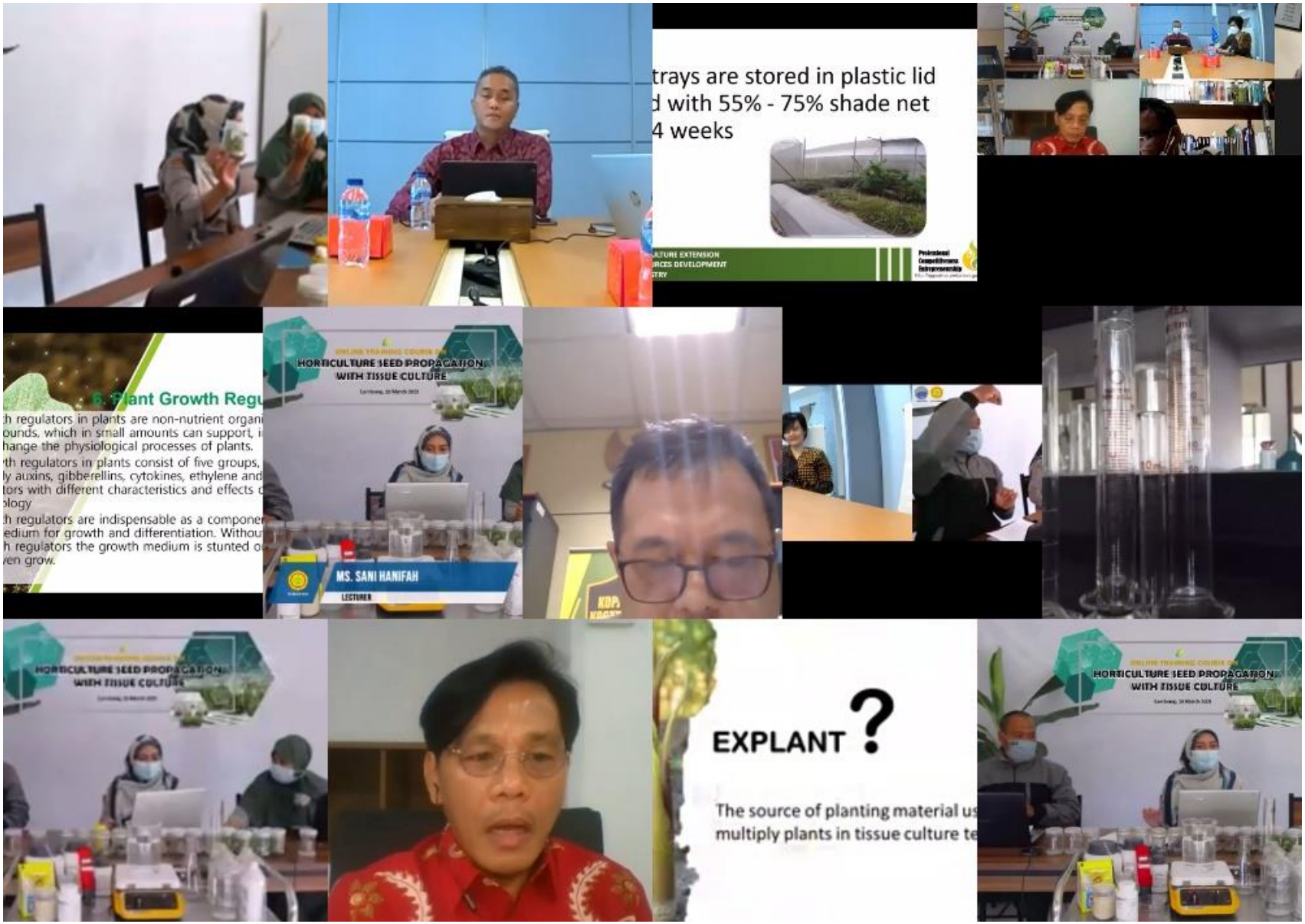


Chart 1. Survey Result


trays are stored in plastic lid
d with 55% - 75% shade net
4 weeks
HORTICULTURE SEED PROPAGATION
WITH TISSUE CULTURE
MS. SANI HANIFAH
LECTURER
EXPLANT ?
The source of planting material us
multiply plants in tissue culture te