The 3rd FSSAT International Conference Attendance List Room 6, Moderator Prof. Dr. Ir. Rahim Darma, MS.

e ABS	Name	Name of Institution	Date of attendance at international conferences	Title	Status of attandence
S-43	Arif Susila	Assessment Institute for Agricultural Central Java	January 8th 2021	Growth and results test of adaptive superior rice varieties through integrated components in the rains of Central Java Rain	Presenter
S-300	Muh. Farid BDR	Department of Agronomy, Faculty of Agriculture, University of Hasanuddin	January 8th 2021	Effect of planting spaces and fertilization package on the productivity and prolific level of Maize	Presenter
S-302	Ida Suryani	Faculty of Agriculture and Technology, Cokroaminoto University	January 8th 2021	The morphological characteristic and classification of inceptisol soil in few land at Mamuju Regency, West Sulawesi	Presenter
S-47	Nila Wardani	Lampung Assessment Institute for Agricultural Technology	January 8th 2021	Off-Season cultivation of several shallot varieties in dry land, Lampung	Presenter
S-53	Muthmainnah	Faculty of Agriculture, Hasanuddin University	January 8th 2021	53] The effect of compost application on soil fertility parameters and cocoa productivity	Presenter
S-71	Reli Hevrizen	Lampung AIAT	January 8th 2021	Climate, land area, and fertilizer distribution policy supports to Lampung Strategic Food Production	Presenter
S-73	Husna	Halu Oleo University	January 8th 2021	Influence of media and natural seedlings height on growth and survival of eha (Castanopsis buruanaMiq.)	Presenter
S-75	Conny N Manoppo	North Sulawesi Assessment Institute of Agricultural Technology, Indonesia	January 8th 2021	Farming analysis of soy bean cultivation under coconut plantation in North Sulawesi	Presenter
S-77	Syofia Asridawati	Agrotechnology Department, Pelalawan School of Technology (STT Pelalawan)	January 8th 2021	Nutrient uptake of corn plant as affected by addition of rock dust that have been treated by heating and humic materials	Presenter
S-97	Zahraeni Kumalawati	Study Program of Food Crop Production Technology, Department of Plantation, Pangkep State Polytechnic of Agricultural	January 8th 2021	Effect of sucrosin biostimulant on early growth of sugarcane (Saccharum officinarum L.) var. CM 2012	Presenter
S-98	AE Marpaung	Postgraduate Student of agriculture Faculty, Universitas Sumatera Utara, Medan	January 8th 2021	98] The effect of liquid organic fertilizer and phosphate solubilising bacteria basillus sp on potato growth (Solanum tuberosum) in andisol soil	Presenter
S-309	Rinaldi Sjahril	Laboratory of Plant Bio-science and Reproduction Biotechnology, Faculty of Agriculture, Universitas Hasanuddin	January 8th 2021	Flow cytometry analysis on colchicine induced polyploid of Katokkon peppers (Capsicum chinense Jacq.)	Presenter

Makassar, January 8th 2021

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Flow cytometry analysis on colchicine induced polyploid of Katokkon peppers (*Capsicum chinense* Jacq.)

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Flow cytometry analysis on colchicine induced polyploid of Katokkon peppers (*Capsicum chinense* Jacq.)

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Abstract. A preliminary study was conducted to determine the ploidy level of Katokkon pepper after colchicine induction using flow cytometry analysis. Compared to squash method, flow cytometry analysis can provide effectively faster results of the ploidy levels of the cells. The research was conducted at the Laboratory of Plant Bioscience and Reproduction Biotechnology, Department of Agronomy, Faculty of Agriculture, Hasanuddin University Makassar. Polyploidy of the Katokkon pepper (*Capsicum chinense* Jacq.) were induced by immersing the seeds in colchicine solution at concentrations of 0.00%, 0.0125%, 0.025%, 0.050% (w/v). For each concentration, an immersion time of 1.5, 3.0 and 4.5 hours were employed, respectively. Ploidy level was analyzed using the flow cytometer machine (Partec® Cy-Flow Space). The resulting histogram of the analysis shows differences between control (0.00%) and the rest of Colchicine treatment. Based on the peak position on the histogram, the colchicine concentration and their various immersion time given did not produce tetraploid (4n) plants. Nevertheless, at 0.10% colchicine concentration with all immersion times, it was obtained mixoploid plants with 2n and 4n pairs of chromosomes.

1. Introduction

Polyploidization is one of modern methods in plant breeding to obtain superior plants with better characters by changing the genetic makeup of the plants [1]. Polyploidy plants are attributed to plants that have three or more sets of chromosomes [2]. The polyploid chromosomes represent the number of more than two paired chromosome sets that can be induced chemically using colchicine. Amanah et al. [3] showed in their study that polyploid plants with three and four sets of chromosomes were obtained from the application of colchicine on cayenne pepper (*Capsicum frustescens* L.).

The successful of polyploidization can be determined by observing the number of mutated chromosomes using a simple way such as in squash method or using flow cytometry. Although the squash technique is quite simple, but it does not allow for large sample analysis because it requires a

relatively long time. Compared to the squash technique, which calculates chromosomes with the aid of a microscope [4], flow cytometry is known as a method to rapidly characterize the optical properties of cells and cell components in an individual by measuring the light emitted or scattered from cells or cell components. The method allows a lot of genetic material to be evaluated simultaneously, and the resulting information can be processed quickly. As a result, this technique allows a large-scale comparative analysis to determine polyploid levels [5]. Plant ploidy analysis can be performed quickly and accurately using flow cytometry with the advantages, among others, of ease and speed of sample preparation, as well as allowing analysis of larger numbers of samples [6].

Flow cytometry (FCM) has been widely used to detect polyploidy in plants such as *Catharanthus roseus* L. G. Don [7], *Brassica napus* L. [8], *Cajanus cajan* L. [9], and *Arabidopsis lyrata* [6]. Ploidy from plants is determined by observing data in the form of a peak curve or histogram peak shown on the monitor screen which is obtained based on the glowing rays captured by the detector on the flow cytometer [6]. Examples of flow cytometry results from haploid, diploid, and mixoploid plants is shown in Figure 1.

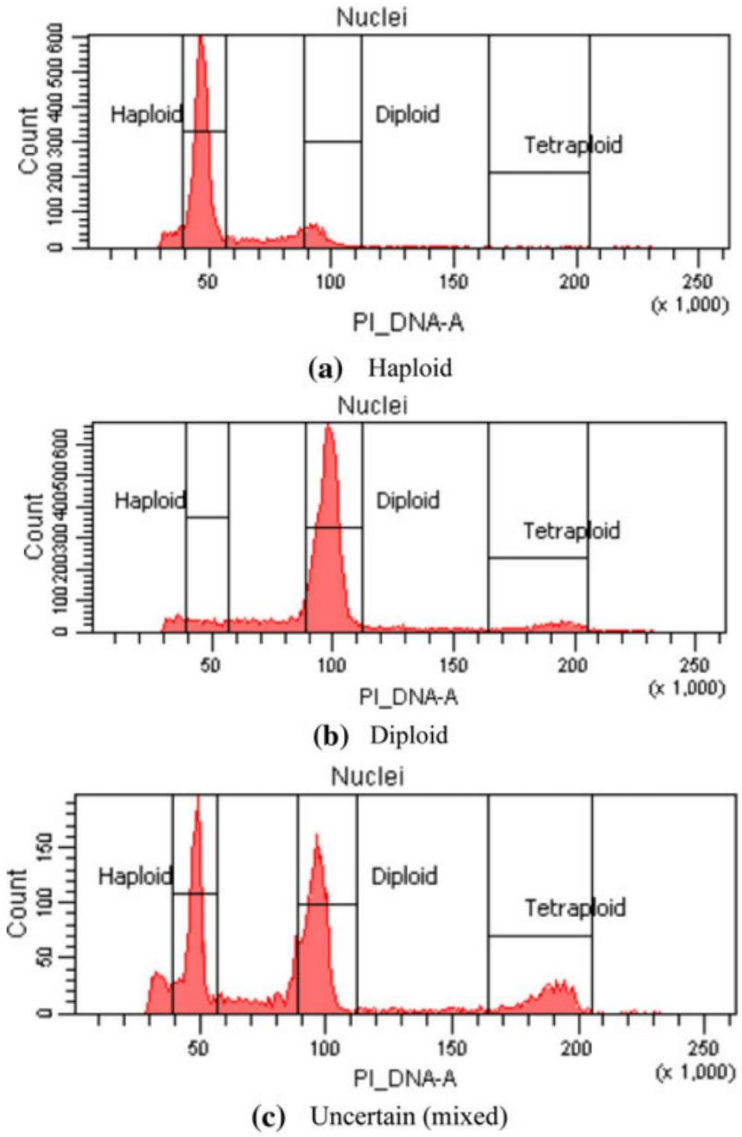


Figure 1. Histogram flow cytometry of *Brassica napus* L. [9].

A preliminary study carried out by the use of high concentrations of colchicine (0.0%, 0.25%, 0.50%, 0.75% and 1.0%) with varied immersion time (1.5 hours, 3 hours and 4.5 hours) in vitro in katokkon pepper (*Capsicum chinense* Jacq.) had been unsuccessful. In this previous study, the results showed that the katokkon shoots failed to develop. The failure was thought due to the colchicine concentration was too high so it was toxic [10]. Therefore, further research was carried out by lowering the colchicine concentration to get the best concentration that could produce tetraploid plants based on plant morphological characters in culture bottles and the results of ploidy level analysis using flow cytometry.

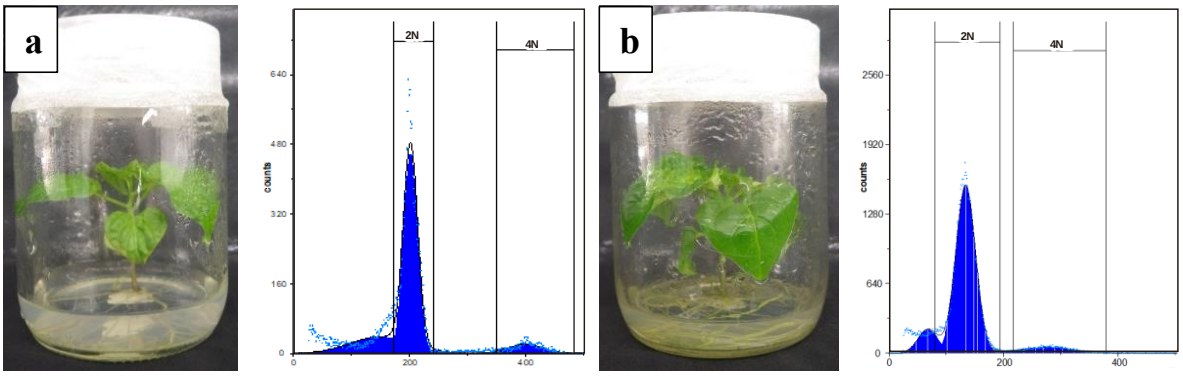
2. Methodology

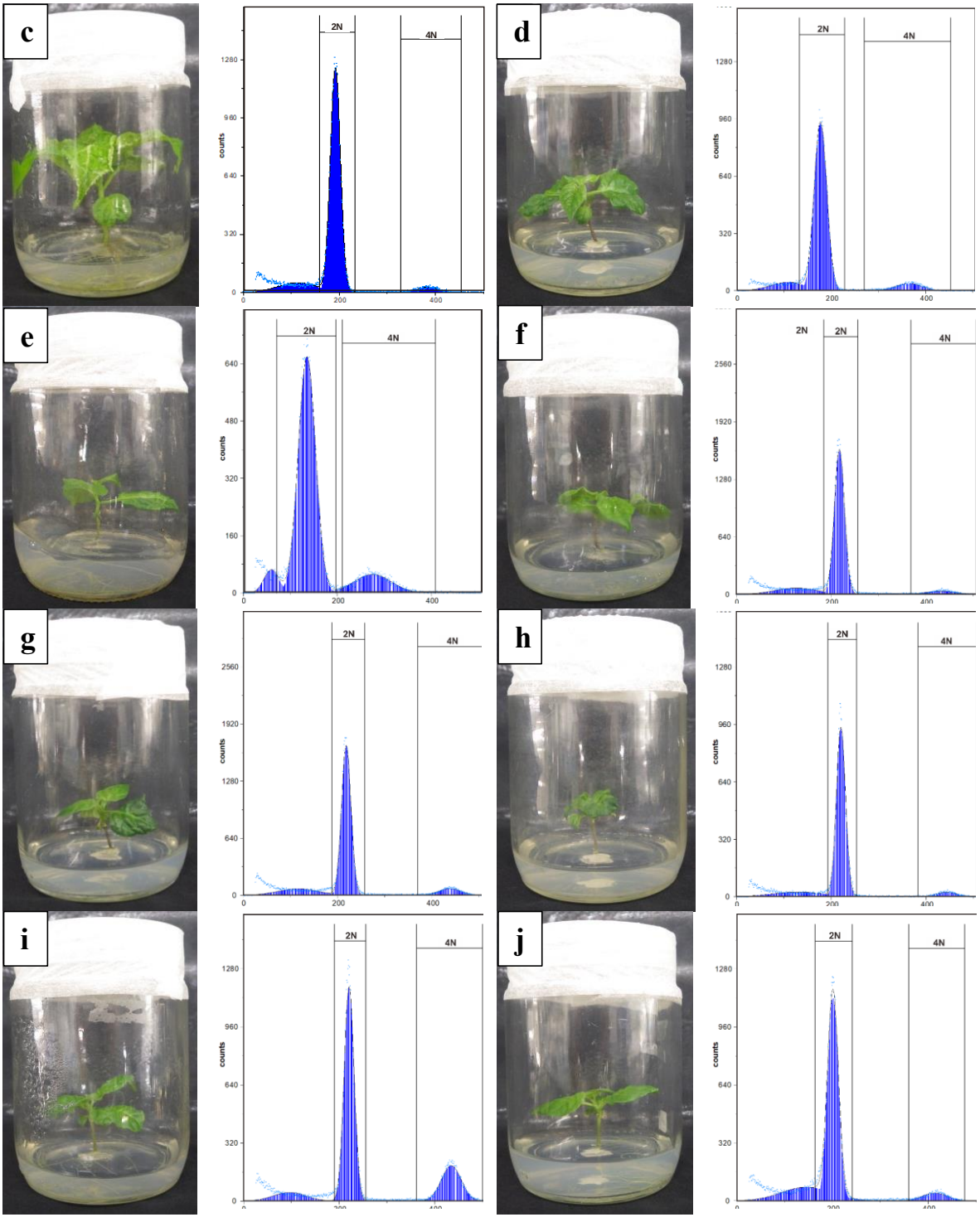
The research was conducted at the Laboratory of Plant Bioscience and Reproduction Biotechnology, Facuty of Agriculture, Hasanuddin University, Makassar. The method used in planting katokkon pepper seeds (*Capsicum chinense* Jacq.) and colchicine induction is based on the results of preliminary study that have been conducted [10]. Lower concentration of colchicine (0.00%, 0.0125%, 0.025%, 0.050% and 0.10%) and immersion time of 1.5, 3.0 and 4.5 hours were used in the recent study compared to those used in the preliminary studies.

Analysis of the degree of ploidy was carried out using the Partec® Cy-Flow Space flow cytometer. Young leaves sample with a size of 0.5 x 0.5 cm was placed separately in a Petri dishes. The leaves were given 250 µl of Cystain Pi extracting buffer. Leaves chopped with a razor blade until smooth for ± 60 seconds. The extract was then filtered on a sample tube filter to obtain about 0.2 µl of phytrate. A total of 800 µl of propidium iodide dye was inserted into the sample tube. Then, the sample tube was placed into the FCM machine for analysis and the results can be obtained directly observed on a computer screen in the form of a histogram.

3. Results and discussion

Colchicine induction is a mechanism that is often used to encourage mutations, resulting in changes in the shape, size and number of chromosomes. In this study, the changes that occurred were marked visually by the size of the plantlets and histograms resulting from the flow cytometry analysis. Colchicine concentration has a significant effect on katokkon pepper (*Capsicum chinense* Jacq.) When viewed from the plantlet morphological characters (Figure 2). Colchicine-induced plantlets were characterized with shorter plants, narrower leaf width and fewer leaves than controls. Polyploid individuals have different morphological characters from diploid plants [3]. Plants treated with colchicine would have shorter plants than diploid plants as control [11].

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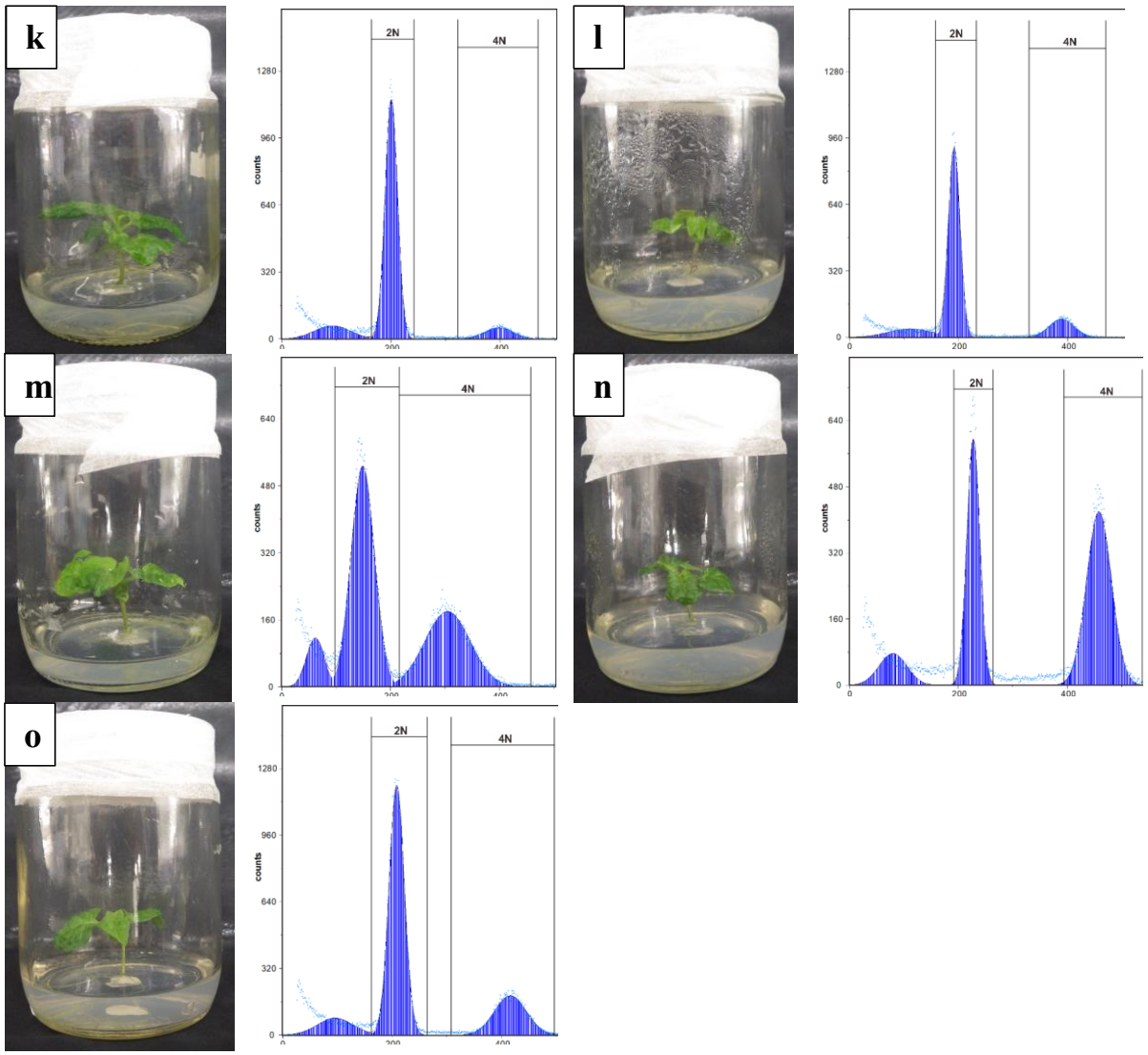

Figure 2. Katokkon pepper plantlets (*Capsicum chinense* Jacq.) treated with several colchicine concentration and immersion time, and the flow cytometric histogram : a (0.00% colchicine, 1.5 hours), b (0.00% colchicine, 3.0 hours),c (0.00% colchicine, 4.5 hours), d (0.0125% colchicine, 1.5 hours), e (0.0125% colchicine, 3 hours), f (0.0125% colchicine, 4.5 hours), g (0.025% colchicine, 1.5 hours), h (0.025% colchicine, 3 hours), i (0.025% colchicine, 4.5 hours), j (0.05% colchicine, 1.5 hours), k (0.05% colchicine, 3 hours), l (0.05% colchicine, 4.5 hours), m (0.10% colchicine, 1.5 hours), n (0.10% colchicine, 3 hours), o (0.10% colchicine, 4.5 hours).

The histogram of the analysis using Partec® Cy-Flow Space shows the difference between the control and the colchicine treatment results. Ploidy from plants is determined by observing data in the form of a peak curve or histogram peak shown on the monitor screen which is obtained based on the glowing rays captured by the detector on the flow cytometer [6]. The peak on channel 200 shows diploid plants while on channel 400 shows tetraploid plants. Based on the peak position on the histogram, the colchicine concentration and immersion time given did not produce tetraploid plants. However, at 0.1% colchicine concentration with various immersion times, mixoploid plants were obtained, this can be seen from the results of the histogram which showed a high enough peak on channel 400 (Figure 2: m, n, and o). The peaks seen on channels 200 and 400 at 0.1% colchicine concentration indicate that the plantlets are mixoploid plants with two and four pairs of chromosomes.

4. Conclusion

Use of the flow cytometer in the analysis of polyploidization of colchicine induced katokkon pepper using a colchicine concentration of 0.0125% - 0.1% with 1.5 - 4.5 hours of immersion, respectively resulted in mixoploid plants with 2 and 4 pairs of chromosomes.

Acknowledgment

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Preface

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PREFACE

It is a great honour for us to be the host of the 3rd International Conference on Food Security and Sustainable Agriculture in the Tropics (FSSAT) on January 8th – 9th, 2021 at Agriculture Faculty of Hasanuddin University, Makassar City of South Sulawesi Province, Indonesia. This conference is a series of international scientific seminars held by the Faculty of Agriculture, Universitas Hasanuddin, Makassar, Indonesia, which has been held annually since 2017.

This conference was held as a forum for exchanging information on productivist paradigm in Indonesian food policies to feed 260 million people targets the self-sufficiency of rice, sago, corn, soybean, and meat production, including the infrastructure development such as dams, irrigation channels building, and the expansion of paddy and sago fields in the Eastern Indonesia. The unintended outcomes of these efforts are the marginalization of the local food system and dispossession of the local communities from their land and food culture. As a consequence, the human-environmental relationship has changed dramatically posing calamitous disaster and slowly disappearing foodways through local wisdom in everyday life of the local community. It also brings health issues due to the excessive use of chemical agricultural inputs in production, and the increase of degenerative disease and obesity due the unhealthy practices in the consumption level.

The International Conference on Food Security and Sustainable Agriculture in the Tropics will be held every two years, the first in 2017, the second in 2019, and the third in 2021. The covid-19 conditions that have hit the whole world have resulted in restrictions on activities to reduce the spread of Covid-19 sufferers so that the conference model from the form of a live conference has turned into a virtual conference.

The condition of the Covid-19 pandemic has raised concerns about food security throughout the world, including Indonesia, through restrictions on community activities. Several things have implications for the existence of Covid-19, including the occurrence of a very significant supply chain disruption caused by a reduction in capacity to produce food, closing transportation routes so that it will slow down the distribution of food from producers to consumers. The inability of people to consume enough healthy and nutritious food will reduce the immune system and increase disease risk. Thus ensuring an affordable food supply chain is essential during the Covid-19 outbreak. To solve this problem globally, cooperation is needed that involves scientists, academics, practitioners, professionals, governments, entrepreneurs, and communities across countries. To build a network between stakeholders, an international conference held by the Hasanuddin University Faculty of Agriculture in 2021 is important as a forum for building connectivity between researchers and/or research institutions. At this conference, a multi-disciplinary approach based on the knowledge and experience of scientists, researchers, practitioners, and policymakers will be brought together.

If the meeting cannot be held virtually, then solutions in dealing with the food crisis during the Covid-19 pandemic will not find a way out and add to the length of the crisis period chain.

This conference presents keynote speakers from 5 countries, namely Dr. Ir. Bayu Krisnamurthi, M.Si.from IPB University, Indonesia, Prof. Dr. Ir. Sumbangan Baja, M.Phil from Universitas Hasanuddin, Indonesia, Prof. Takuya Sugahara from Ehime Univerity, Japan, Dr. Ravindra C Joshi from CABI South-East Asia, Dr. Lau Wei Hong form University

Putra Malaysia, Mr. Moh, Guo-Jhong from ICDF Taiwan. First plenary session and discussion with 2 speakers for 1 hour and the second plenary and discussion with 3 speakers for 2 hours. For participant presentations (oral presentation and video presentation) it was held in 2 sessions, each session was divided into 10 rooms. The number of participants per room was 11-14 participants with an allocation of presentations for 7 minutes/participants conducted in parallel as many as 7 parallel sessions. Discussions session were held in parallel in each parallel session with an allocation of 3 minutes per participant. Virtual FSSAT 3 implementation using the zoom meeting application by the Faculty of Agriculture, Universitas Hasanuddin has which is obtained by subscription.

The seminar participants were attended by lecturers and students from various universities as well as researchers from various research institutions both from the ministry of agriculture and from Agricultural Technology Research Center. The institution of the participants came from Agricultural Technology Research Center, some polytechnic, institute and University, Indonesian Center for Estate Crops Research and Development, International Coconut Community, Center for Agricultural Technology Research and Development, PT Vale Indonesia Tbk, Sorowako. Some from overseas universities: University of New England, Armidale, Australia, and School of Agriculture and Environment of Massey University, Palmerston North New Zealand. Overall participant numbers around 1.034 participants.

There were no significant technical obstacles, speakers and participants from overseas also presented their papers fluently. Apart from sharing zoom rooms, we also created a social media group (WhatsApp) for each class to facilitate communication between participants and organizers.

All published articles are subject to a rigorous selection process and are peer-reviewed by international and national reviewers. On this occasion, we would like to thank all the authors and the team who have actively participated in the 3rd FSSAT conference, expert reviewers who are very responsive to the technical program committee, experienced senior publication chair, Publication Management Center (PMC) of Universitas Hasanuddin, authors and scholars who are enthusiastic in research. Sincerely thank you for your warm support and look forward to working with you in the next future.

Warm Regards,

Dr. Asmita Ahmad, ST., MSi.

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  355 full papers (19 papers rejected)
- **Number of submissions accepted:**
  291 full papers
- **Acceptance Rate (Number of Submissions Accepted / Number of Submissions Received X 100):**
  79.9 %
- **Average number of reviews per paper:**
  6 papers per reviewer
- **Total number of reviewers involved:**
  47 reviewers
- **Any additional info on review process:**
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     At the first stage, abstracts submitted to the committee through the online system available in the website were reviewed by a Scientific Advisory Board/Reviewers for the suitability of the paper's topic to the theme of the conference. Abstracts that suit the theme were accepted and author were notified of the acceptance through the system. Abstract submission and review were conducted simultaneously until abstract submission deadline on October 31, 2020. As many as 364 abstracts submitted through system were reviewed. 1 abstract was rejected as not comply with the theme of the conference. Accepted abstracts were allowed to be presented in an oral or live presentation.
  2. Submission of Full Paper
     At the second stage, authors with abstracts declared accepted by the Scientific Advisory Board/Reviewer and will be presented in the conference were requested to submit a complete manuscript according to the IOP Publishing format. The deadline for receipt of a complete manuscript (full paper) was on December 15, 2020.
  3. Revision of Full Paper
     At the third stage, following the conference that took place on January 8-9, 2021, Authors were requested to revise the full paper according to the input and

suggestions from the conference audiences and re-submit the manuscript through the system until January 31, 2021.

4. Peer review of Full Paper
   At the Fourth stage, full paper previously submitted through system were reviewed following a single blind peer review process. The papers were sent to the Scientific Advisory Boards that consisted of 47 reviewers according to topic of the papers and reviewer's competency. The reviewers are from international scientists and from the Faculty of Agriculture, and Faculty of Animal Husbandry, Hasanuddin University. Review was conducted on content and format of the paper based on IOP Conference Series. The review process was carried out starting from February to March 7, 2021. At this stage, Reviewer submit a decision for the acceptance of the papers for publication in IOP Conference Series.
5. Revision of Reviewed Full Paper
   At the Fifth Stage, Review results were returned to the authors for revision and re-submission online for those accepted for publication (deadline on April 15, 2021). Following the submission of revised manuscript. The submitted papers were then subjected to proofread stage and check for similarity using Turnitin. Papers with similarity check more than 25% were returned to the authors for further revision. Subsequently, papers were prepared for submission to IOP Conference Series.

- **Contact person for queries:**
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