

SFRN 2019

PROCEEDING

Security in
food,
renewable
resources,
and
natural
medicines



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**3rd INTERNATIONAL CONFER-
ENCE ON SECURITY IN FOOD,
RENEWABLE RESOURCES, AND
NATURAL MEDICINES 2019
(SFRN 2019)**

Convention Hall Politeknik Pertanian Negeri Payakumbuh
INDONESIA



hosted by,
Politeknik Pertanian
Negeri Payakumbuh



co-Hosted by,
Universitas Andalas
(UNAND)

QUANTUM-LEAP OF AGRI-FOOD SYSTEM 4.0 AND DELIVERY OF SUSTAINABLE DE- VELOPMENTS GOALS (SDGS)

September 25-26, 2019



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Theme:
“QUANTUM-LEAP OF AGRI-FOOD SYSTEM 4.0 AND DELIVERY OF
SUSTAINABLE DEVELOPMENTS GOALS (SDGS)”

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Welcome Message
**Executive Chairman of The 3rd International Conference on Security in Food,
Renewable resources, and Natural Medicines (SFRN) 2019**



Dear Honorable ladies and gentlemen,

Good Morning and Assalamu'alaikum wr.wb

On behalf of the SFRN 2019 organizing committee, I am really honoured and delighted to welcome all of you to the 3rd International Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019 at the State Polytechnic of Agriculture Payakumbuh, West Sumatra Indonesia

Our technical program is rich and varied with 8 keynote speeches and 4 invited talks and more than 170 technical papers split between 8 parallel oral sessions and 1 poster sessions. The speakers and participants came from 8 different countries, consist of Academicians, Scientists, Researchers, Practitioners, Professionals, and Government Officials in multidiscipline branch of knowledge, who gathered here today to share and discuss new findings and applications of innovations for promoting Food Security, Renewable Energy, Sustainable Resources and HealthCare Free for All, in particular for those who in needs. As the chairman of conference 2019 SFRN, I know that the success of the conference depends ultimately on the how many people who have worked in planning and organizing both the technical program and supporting social arrangements. This year, the conference is jointly organized by the Payakumbuh State Agricultural Polytechnic and Andalas University. We also thank to the steering committee for their wise and brilliant advice on organizing the technical program; and also to the the Program Committee, both from the Payakumbuh State Agricultural Polytechnic and Andalas University , for their thorough and timely reviewing of the papers and to the Director of Payakumbuh State Agricultural Polytechnic and the rector of Andalas University, and the Head of the Institute for Research and Community Service of Andalas University, and Payakumbuh State Agricultural Polytechnic. Our recognition should go to the Organizing Committee members who have all worked really hard for the details of the important aspects of the conference programs and social activities, and then we extend our gratitude to our students who bore the arduous burden for preparing this event.

We hope this event is also a good step in gaining strengthened cooperation between our universities as we know that the State Agricultural Polytechnic of Payakumbuh is part of the Andalas University previously, of course the psychological relationship between the State Agricultural Polytechnic and the Andalas University is really close.

Finally on behalf of the committee, we apologize profusely for all the shortcomings and everything that is not properly in organizing this event and hopefully AES-Network contributes significantly to the research and technology for the good of humanity.

Thank you

Fithra Herdian, S.TP, MP

**Message from Afro-Eurasia Scientific (AES) Network
3rd International Conference on Security in Food, Renewable resources, and
Natural Medicines (SFRN) 2019**



Dear Honorable and Distinguished guests,
Ladies and gentlemen,

Assalamu'alaikum Warahmatullahi Wabarakatuh and Good Morning

On behalf of the AES Network, I am honored and delighted to welcome you to the 3rd International Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019 at the Agricultural State Poly Technique of Payakumbuh, Indonesia. I believe we have chosen a venue that guarantees a successful technical conference amid the culture, delicacy and scenery of Payakumbuh, the city of "Rendang".

The AES-Network aims to Promote Livelihood Through Food Security, Promote Future Smart and Green Mobility by Using Renewable Energy, Promote Prosperity by Equally Managing and Distributing the Sustainable Resources and Promoting Enjoyable Long-Life by using Natural Medicines With Free Health Care For All. The AES-Network was established in 2018 and already have memberships from 12 countries. Our members consist of Academicians, Scientists, Researchers, practitioners, professionals, and government officials from multidiscipline branch of knowledge, who gathered and contributed their expertise to share and discuss new findings and applications of innovations for promoting Food Security, Renewable Energy, Sustainable Resources and Free Health Care for All. In particular, the network aims to alleviate the condition of those who in dire needs. In the future, we also expect to provide technical demonstrations, and numerous opportunities for informal networking for Promoting Food Security, Renewable Energy, Sustainable Resources and Free Health Care for All. In this opportunity, we invited you to become our members and join our efforts for a better life to all of mankind.

As a team, we acknowledge the existence of mutual interest among university and college educators, researchers, activists, business sector, entrepreneurs, policy

makers, and all society members. We must promote the need to strengthen cooperation for establishing Security in Food, Renewable Resources, and Natural Medicines in Africa, Europe, and Asia.

The AES-Network believe, a firm foundation for mutual collaboration with the spirit of equality and partnership and thereby contribute towards sustainable development in these three regions.

Therefore, through networking, friendships, and joint efforts, the capacity of our network can be enhanced to address major challenges in securing the Food, Renewable Resources, and Natural Medicines in Africa, Europa, and Asia. Our Network goals are to increase the awareness of educators, researchers, scientific community, business sector, entrepreneurs, and policy makers in Africa, Europa, and Asia, that the future of a better world, lies within their responsibilities, and to improve the networking, mobility and mutual collaboration of scientific community, business sector, entrepreneurs, and policy makers in Africa, Europe, and Asia to energize the delivery of Sustainable Development Goals.

Finally, I hope that, by registering our network, you will be provided a common platform and support the exchange of knowledge, while at the same time, we offer constructive dialogue across and within the various interest and stakeholder groups, including the intended beneficiaries, and arrived at the best solutions to our terminal goal, Promoting Food Security, Renewable Energy, Sustainable Resources and Free Health Care based on scientific evidence in Africa, Europa, and Asian region.

Thank You for Joining us!

President

Assoc. Prof. Dr. Eng. Muhammad Makky

Welcome Message
Head of Institute for Research and Community Service
Universitas Andalas



Dear Honorable and Distinguished guests,
Ladies and gentlemen,

Assalamu'alaikum Warahmatullahi Wabarakatuh and Good Morning

It is with great pleasure that I welcome the participants of the SFRN 2019 in Payakumbuh, the city of “Rendang”, the prime of Indonesian delicacy.

In this esteem event, we share the knowledges, and imparted it to the people. The quest for knowledge has been from the beginning of time but knowledge only becomes valuable when it is disseminated and applied to benefit humankind. It is hoped that this conference will become a platform to gather and disseminate the latest knowledge which can be adopted for securing the food, resources, and health for mankind, in Asian, European and African region.

Academics, Scientists, Researchers and practitioners from multidiscipline branch of knowledge who gathered here today will be able to share and discuss new findings and applications of innovations for ensuring food security, in particular for those who reside in developing countries. It is envisaged that the intellectual discourse will result in future collaborations between universities, research institutions and industry both locally and internationally. In particular it is expected that focus will be given to issues on environmental and sustainability. Therefore, we urge to all participants, to establish a scientific network that will voice the needs

Researchers in the multi sectoral aspects related to the benefit of mankind have been progressing worldwide. Food is a basic right, while energy drive the world. Human need a lot of resources so the civilization can be flourished. But human is not immune, and thus, ones need to take care of their health regularly. Modern Agri-food systems is the foundations of a decent life, a sound education and the achievement of

the Sustainable Development Goals. Over the past decade, we have witnessed a chain reaction that threatens the very foundations of life for millions of the world's people. Rising energy prices drove up the cost of food and ate away the savings that people otherwise would have spent on health care or education. Unsustainable plantation management induced forest fire and posed haze hazard to the whole Sumatra island and our neighboring countries.

The human cost of the food and energy crisis has been enormous. Millions of families have been pushed into poverty and hunger. Thousands more suffering from the collateral effects. Over the past year, food insecurity led to political unrest in some 30 countries. Yet because the underlying problems persist, we will continue to experience such crises, again and again -- unless we act now. That is why we are here today.

We must make significant changes to feed ourselves, and most especially, to safeguard the poorest and most vulnerable. We must ensure safety nets for those who cannot afford food, or energy, nor even a health service. We must transform agricultural development, markets and how resources is distributed. We must do so based on a thorough understanding of the issues. That is the only possible way we can meet the Goals of Sustainable Development.

Thank You,

Assoc. Prof. Dr.-Ing. Uyung Gatot S. Dinata,MT.

**Opening Ceremony
Rector of Andalas University**



Dear Honorable and Distinguished guests,
Ladies and gentlemen,

Assalamu'alaikum Warahmatullahi Wabarakatuh and Good Morning

I welcome the opportunity to address you at this important event.

It gives me great pleasure in welcoming you to this 3rd Conference on "Security in Food, Renewable resources, and Natural Medicines (SFRN)" 2019. I am delighted that so many have accepted our invitation. I am particularly happy that we have in this room, dedicated individuals from so many stakeholder groups — including our most respected and distinguished guest “The ministry of Agriculture of the Republic of Indonesia”. We also welcome the mayor of Payakumbuh and the Regent of Lima Puluh Kota. We extend our welcome to the civil society, the private sector, international organizations; the science community; and others dedicated to help create an environment in which people can escape food insecurity. Imagine what we can do together if we make the security for all as an our top priority, and pull in the same direction. We can make a difference in the lives of millions.

Food is a basic right. Food security are the foundations of a decent life, a sound education and the achievement of the Sustainable Development Goals Access to medicines - a fundamental element of the right to health. Health is a fundamental human right, indispensable for the exercise of many other rights in particular the right to development, and necessary for living a life in dignity. Moreover, human rights principles and language are being used to support resource access claims as rights-based approaches empower individuals and groups to gain or maintain access to natural resources

Much progress has been made during the last decades but much more needs to be done. Millions of people are Insecure worldwide, meaning that they either starve or they do not know from where their next meal, health care or resources will come.

Much of the progress on security has occurred at the expense of our environment. With business as usual, we foresee that the production improvements during the next decade will be less than the last one, while the environmental degradation will continue, and health will deteriorate significantly. Without available resources to seek, mankind will become endanger species in a very short time.

Solutions to the security problems need to be designed and implemented within a new and rapidly changing environment. Globalization and sweeping technological changes offer new opportunities for solving these problems. A number driving forces or trends must be taken into account in developing appropriate action. Some of the action needed, such as appropriate technology for small farms, is not new but it must be cast in the new and changing global and national environment, taking into account new opportunities and risks. I hope that by providing a forum for knowledge exchange, this conference will help identify the action to be taken. Furthermore, this conference will help to provide constructive dialogue across and within the various interest and stakeholder groups, including the intended beneficiaries, and arrive at the best solutions.

In conclusion, even if those responsible give high priority to achieving sustainable security for all and back it up with action, the world may not achieve the goal by 2030. But we will be much closer than with business as usual. I urge all of us to provide the strongest support for this event, to enable securing the food for all in the closest time possible. It is my sincere optimism that through the accomplishment of the objectives of this event, we will come to an important step nearer to secure the food for all.

Finally, I would like to thank the organizing committee who have spent their utmost efforts to prepare and manage this event successfully. Let me conclude my remarks by wishing our guests happiness, good luck and great success in the conference.

May I announce now the opening of the “3rd International Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019” in Payakumbuh.

Thank you.

Rector,
Prof. Tafdil Husni, SE, MBA, PhD

Welcome Message
Director of Politeknik Pertanian Negeri Payakumbuh



Dear Honorable ladies and gentlemen,

Good Morning and Assalamu'alaikumwr.wb

I congratulate to all participants on the invitation and participate at our beloved campus Payakumbuh State Agricultural Polytechnic. I feel really honoured to welcome all of you at our event, the 3rd International Conference on Security in Food, Renewable Resources, and Natural Medicines (SFRN) 2019 at the Payakumbuh State Agricultural Polytechnic, Indonesia.

Food security is a very important aspect in a country's sovereignty. Food also determines the future direction of a nation. Many social and political fluctuation can also occur if food security is disrupted. Food availability that is smaller than its needs can create economic instability. This critical food condition can even endanger economic and national stability. In the current situation, there are many challenges in exteriorize food security, such as climate change, population, limited natural resources and other challenges both locally, regionally and globally.

Renewable resources are also our starting point to start sustainable development. Research on renewable resources is also very important as the solution in meeting the principles of sustainable development. As we know that Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainability is the foundation for today's leading global framework for international cooperation - the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs)

The discovery of treatment based on local culture also contributes greatly to the good of humanity. Unfortunately, there are still many treatments that have not been carried out by scientific research. So, through this conference we hope it can be a trigger to increase in traditional plant-based treatments that not go through complex

chemical processes, so that the effectiveness of the pillars can be further suppressed and also contribute to the community's economy.

Finally, I would like to express my gratitude to all people who involved in organizing this event and to all of stakeholders who have helped to make this event go on successfully. Please accept my apologize for any shortage, Assalamu'alaikumwr.wb.

Thank you

Ir. Elvin Hasman, MP

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The Role of Various Types and Dosage of Biological Compost (Bio-Compost) on Biology and Soil Fertility in Ginger (*Zingiber officinale*. L)

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Politeknik Pertanian Negeri Payakumbuh
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Abstract. Prospects of ginger in Indonesia are still quite good, especially for exports, the traditional medicine industry, the food, and the beverage industry. Increasing crop productivity by using chemical fertilizers and pesticides is not a wise way. Consumer pressure for agricultural products that are free of pesticide residues and chemical fertilizer has been increasing in expectation of a safe food for consumption and a healthy environment. The combination of using organic fertilizer and biological fertilizer is one solution to answer this challenge. This study aims to determine the role of various types and dosages of biological compost on biology and soil fertility planted with ginger (*Zingiber officinale* L). The design used is factorial design with Randomized Block Design (RBD) (4 x 3), in which Factor K (bio-compost type) with 4 levels, were K1 = livestock manure compost, K2 = tithonia bio-compost, K3 = straw bio-compost, and K4 = without bio-compost. Factor D (dosage) with 3 levels, were D1 = 3 tons / Ha; D2 = 6 tons / Ha, D3 = 9 tons / Ha, so there were 36 experimental plots. The treatment is carried out at the time of planting by putting into the planting hole. Observations were made at the age of 60 days after planting. The data obtained were analyzed for variance (Anova) and continued by the Duncan test. The results showed that the highest bacterial population was obtained in a treatment of without bio-compost, the highest pH in the bio-compost of livestock manure at a dose of 6 tons/ha, the highest EH in a combination of straw bio-compost at a dose of 3 tons/ha, and the highest EC in the combination Tithonia bio-compost with a dose of 3 tons/ha.

Keywords: bio-compost, ginger, soil biology, soil fertility.

INTRODUCTION

Ginger (*Zingiber officinale* Rosc) is one of the most commonly used herbs, traditional medicinal ingredients, spices, refreshments, and as a commodity export commodity for non-oil and gas. The supply of ginger from Indonesia to importing countries of ginger in recent years is quite increasing. However, an increase in demand for ginger cannot be offset by an increase in ginger production. Indonesian ginger is exported to several destination countries such as Japan, UAE, Malaysia in the form of fresh ginger, dried ginger and processed (Paimin and Murhananto, 1999).

Ginger has long been cultivated as an export commodity, but the development of ginger on a wide scale has not supported the optimal and sustainable cultivation so that productivity and quality are still low. Various cultivation efforts need to be done to support the resulting good production.

In addition to the use of organic matter is also very instrumental in supporting the increase in plant growth and development. Organic matter plays a role in improving the physical, biological and even chemical properties of the soil. According to Sulistyawati and Nugraha (2011), Soil structure and fertility can be improved with the use of compost.

Increasing the productivity of food crops by using inorganic fertilizers and pesticides (chemicals) is not a wise way, and currently, due to the consumer pressure to want agricultural products free of pesticide residues and artificial fertilizers so that these products must be safe for consumption and the creation of the healthy environment (Sutanto, 2002).

The application of biotechnology and organic materials is an alternative that is considered very appropriate to answer all of these challenges, one of the ways by using multipurpose microorganisms that both as a fertilizer and biological pesticides and plant growth stimulants (PGR), then combined with an organic fertilizer in a form of bio-organic fertilizer.

Organic fertilizer is a fertilizer that consists mainly or entirely of organic material derived from plants and/or animals that have been produced by engineering process, which can be in the form of solid or liquid which is used to supply organic materials to improve physical, chemical, and biological properties of the soil. Whereas biological fertilizer is defined as inoculants made from active living organisms which are functional groups of soil microbes that have a function as providers of nutrients in the soil so that they can be available to plants (Suriadikarta and Simanungkalit, 2012).

This study aims to determine the role of various types and dosages of biological compost on biology and soil fertility planted with ginger (*Zingiber officinale* L).

MATERIALS AND METHOD

The design used is factorial design with Randomized Block Design (RBD) (4 x 3), in which Factor K (bio-compost type) with 4 levels, were K1 = livestock manure compost, K2 = tithonia bio-compost, K3 = straw bio-compost, and K4 = without bio-compost. Factor D (dosage) with 3 levels, were D1 = 3 tons / Ha; D2 = 6 tons / Ha, D3 = 9 tons / Ha, so there were 36 experimental plots. The treatment is carried out at the time of planting by putting into the planting hole. Observations were made at the age of 60 days after planting. The data obtained were analyzed for variance (Anova) and continued by the Duncan test.

Result and Discussion

Results

1. Bacterial Population

Tabel 1. The effect of giving various types and dosages of bio-compost on microbial populations in ginger.

Kind of Bio-Compost	Dosage			Main effect of Bio-Compost
	D1	D2	D3	
K1	209,33 ab	197,33 ab	138,67 b	181,76
K2	181,33 ab	190,67 ab	188,00 ab	186,67
K3	193,33 ab	185,33 ab	166,67 ab	181,78
K4	289,33 a	174,67 ab	212,00 ab	225,33
Main effect of				
Dosage	291,11	187,00	176,34	

Note : Numbers in the same column followed by the same small letters and the Numbers on the same row followed by the same capital letters are not significantly different from the DNMR test at a 5 % level.

Table 1 shows that the K4D1 (without provision of bio-compost) combination treatment gave the best interaction effect on the bacterial population variable on all kind of bio-compost treatments at all tested dose levels and the combination treatment of K1D3 (bio-livestock manure compost) provides the least favorable interaction effect.

Through analysis of variance generally known that the kind of bio-compost treatment and the treatment of dosage gave a real interaction effect on the percentage of the microbial population. The difference in the combination of treatment and dosage occurs in the treatment of bio-livestock manure compost with the treatment of both no treatments of type of bio-compost, whereas the treatment of giving other types of compost with various doses has no significant difference.

Significant differences occur from the interaction of treatment without the provision of bio-compost with variables from various interactions of bio-compost treatment, because within 60 days, various treatment interactions have caused competition between microbes, both in the struggle for food (compost) as well as the predatory and parasitic nature of microbes, so the bacterial population in various treatment interactions decreases.

This is in accordance with the statement of Almustanadat (2015) that the negative relationship between 2 microbial populations, both of which have experienced a loss characterized by a decrease in living cells and growth. Competition occurs in 2 microbial populations that use the same nutrients/food, or in a limited nutrient state.

2. EC (Electrical Conductivity)

Tabel 2. The effect of giving various types and dosages of bio-compost on EC in ginger.

Kind of Bio-Compost	Dosage			Main effect of Bio-Compost
	D1	D2	D3	
K1	0,2237 c	0,7937 ab	0,8697 a	0,6290
K2	0,4587 abc	0,3113 bc	0,5407 abc	0,4369
K3	0,5280 abc	0,3247 abc	0,2160 c	0,3563
K4	0,2867 bc	0,2347 c	0,2050 c	0,2421
Main effect of				
Dosage	0,3743	0,4161	0,4579	

Note : Numbers in the same column followed by the same small letters and the Numbers on the same row followed by the same capital letters are not significantly different from the DNMR test at a 5 % level.

Table 2 shows that the treatment and the interaction of Livestock Bio-compost at a dose of 9 tons/ha (K1D3) provide the best interaction effect on the EC variable for all kinds of interaction treatments of bio-compost at all dose levels tested. The combination treatment of K4D3 (without provision of bio-compost) provides the least favorable interaction effect.

Through analysis of variance generally known that the kind of bio-compost treatment and the treatment of dosage gave a real interaction effect on the percentage of electrical conductivity. Significant differences occur from the interaction of treatment without the provision of bio-compost with variables from various interactions of bio-compost treatment, because within 60 days, various treatment interactions have caused the increase of solution concentration which can increase EC. Associations between species that cause one party harmed, the other party benefits or is not affected anything. The relationship between microorganisms and other organisms that suppress each other's growth is called antagonism. This form of interaction is an asocial relationship. Usually, one species produces a chemical compound that can poison other species which causes the growth of other species to be disturbed. The chemical compounds produced can be secretions or secondary metabolites. Examples of antagonisms include *Streptococcus lactis* with *Bacillus subtilis*. Growth of *B. subtilis* will be inhibited because of lactic acid produced by *S. lactis*. Antagonistic interactions are also called antibiotics (Kusnaedi, 2018)

3. EH (Redox Potential)

Tabel 3. The effect of giving various types and dosages of bio-compost on EH in ginger.

Kind of Bio-Compost	Dosage			Main effect of Bio-Compost
	D1	D2	D3	
K1	126,93 cde	124,92 de	139,50 bcd	130,45
K2	138,55 bcd	143,50 b	142,12 bc	141,39
K3	160,13 a	131,30 bcde	138,80 bcd	143,41
K4	117,70 e	130,40 bcde	117,70 bc	121,93
Main effect of Dosage	135,83	132,53	134,53	

Note: Numbers in the same column followed by the same small letters and the Numbers on the same row followed by the same capital letters are not significantly different from the DNMRT test at a 5 % level.

Through analysis of variance is known that interaction of the provision of all kinds of bio-compost treatment and doses give a real interaction effect on EH, the provision of bio-straw compost for 3ton/ha (K3D1) combination treatment gave the best interaction effect on the EH variable for all K treatments at all tested dose levels. The combination treatment of K4D3 (without provision of bio-compost) provides the least favorable interaction effect.

As on EC, microbial interactions in an environment will lead to an increase in solution levels in the microbial environment. The differences that occur in the EH are also caused by various microbial activities.

Enny Widyati (2013) stated that the area in the soil occupied by parts of plants (roots) that interact with microbes is commonly known as rhizosphere (rhizosphere). Rhizosphere is the environment in the soil around the roots of a plant where the chemical and biological activities are directly affected by the root. So the chemical and biological activities in the area are intensively influenced by the chemical compounds produced by the roots and by the microorganisms that inhabit the area. Rhizo-sphere as an area of micro-ecology that is directly in contact with the roots of plants. So that rhizo-sphere is an area where there is an interdependence between the roots of plants and the associated microbes

4. PH (Soil Acidity)

Tabel 4. The effect of giving various types and dosages of bio-compost on PH in ginger.

Kind of Bio-Compost	Dosage			Main effect of Bio-Compost
	D1	D2	D3	
K1	4,5467 a	4,5633 a	3,7833 e	4,2978
K2	4,2933 abc	4,2067 abc	4,0900 cde	4,1967
K3	3,8067 de	4,2267 abc	4,1533 bcd	4,0622
K4	4,0700 cde	4,2100 abc	4,4633 ab	4,2478
Main effect of Dosage	4,1792	4,3017	4,1225	

Note: Numbers in the same column followed by the same small letters and the Numbers on the same row followed by the same capital letters are not significantly different from the DN MRT test at a 5 % level.

Through analysis of variance is known that interaction of the provision of all kinds of bio-compost treatment and doses give a real interaction effect on PH, the combination treatment of bio-livestock compost with 3 Ton/ha of dose (K1D1) and bio-livestock compost with 6 Ton/ha of dose (K1D2) gives the best interaction effect on the pH variable on all K treatments at all dose levels tested. The combination treatment of bio-livestock compost with 9 Ton/ha of dose (K1D3) provides the least favorable interaction effect.

The decrease in pH is generally caused by the addition of perishable organic compounds into the soil. The decrease in pH will be faster if the addition of excessive organic compounds and the addition of microbes, both of which tend to produce acidic chemical compounds. Bio-livestock compost is a combination of organic compounds and microbes, it can greatly stimulate increased soil acidity.

The chemical compounds produced can be secretions or secondary metabolites. Examples of antagonisms include *Streptococcus lactis* with *Bacillus subtilis*. Growth of *B. subtilis* will be inhibited because of lactic acid produced by *S. lactis*. Antagonistic interactions are also called antibiotics (Kusnaedi, 2018)

CONCLUSION

From the research that has been carried out can be concluded that:

1. Interaction of the provision of all kinds of bio-compost treatment and doses give a real interaction effect on Microbial Population, EC, EH and PH in Ginger.
2. The treatment of without provision of bio-compost give the best interaction effect on the microbial population variable on all bio-compost treatments at all tested dose levels.

3. The treatment of bio-livestock compost with 9 Ton/ha of dose give the best interaction effect on the EC variable on all bio-compost treatments at all tested.
4. The treatment of bio-straw compost with 3 Ton/ha of dose give the best interaction effect on the EH variable on all bio-compost treatments at all tested.
5. The treatment of bio-livestock compost with 3 Ton/ha of dose and bio-livestock compost with 6 Ton/ha of dose give the best interaction effect on the PH variable on all bio-compost treatments at all tested.

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REFERENCES

- Almustanadat, 2015. Interaksi Antar Mikroba. KETAHANAN PAKAN TERNAK INDONESIA.
- Enny Widyati, 2013. Memahami Interaksi Tanaman – Mikroba. Balitbang Kehutanan. Bogor.
- Kusnaedi, 2018. Interaksi Mikroorganisme Dengan Organisme Lain. UPI. Jakarta
- Paimin F.B, dan Muharnanto. 2000. Budidaya, Pengolahan, Perdagangan Jahe. Penebar Swadaya. Jakarta. 115 hal.
- Sulistiyawati dan Nugraha. 2011. Efektivitas Kompos Sampah Perkotaan sebagai Pupuk Organik dalam Meningkatkan Produktivitas dan Menurunkan Biaya Produksi Budidaya Padi. Sekolah Tinggi Ilmu dan Teknologi Hayati. Institut Teknologi Bandung. Bandung.
- Suriadikarta, D.A. & Simanungkalit, R.D.M. (2012). Pupuk organik dan pupuk hayati. Badan Penelitian dan Pengembangan Pertanian. Kementerian Pertanian Jakarta. 1-10 hal.
- Sutanto, D., Munir E. & Yumaliza. (2002). Eksplorasi bakteri kitinolitik : keragaman genetik gen penyandi kitinase pada berbagai jenis bakteri dan pemanfaatannya. Laporan Penelitian Hibah Bersaing. Universitas Sumatera Utara. Medan. 26 hal.