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Preface

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Preface

Dear all,

On behalf of the committee, let me first deeply express my thanks to all of you contributing to our ICBEAU-19 event.
The seminar was held successfully, and we have discussed in a very fruitful atmosphere and for that reason, I just hope that each of you will get mutual benefit from our 1st ICBEAU Meeting. Based on that fact, we plan also our 2nd ICBEAU next year.
Now it's time for us as the committee to document each of the interesting articles in a seminar proceeding. In this manner, we are very lucky since The IOP-Publisher is kindly welcoming us to publish our proceeding. As you know, the IOP-Publishing is already well known as one of the publishers for many and broaden scientific works. For that reason, let me express our great thanks especially to the IOP Publisher.
This proceeding covers a total of 52 articles that have been presented and discussed intensively during the ICBEAU-19 meeting. It is structured in five subtopics, based on their topic similarity. Each of the articles has been examined and processed in an extensive review process involving experts in their specific field. The process has also been subjected to the control of their similarity script check to keep and maintain its scientific ethic as well as English readable assurance. All those mentioned processes were performed to assure the quality of each article.
In this opportunity let me sound my great thanks to all parties involving and contributing to the implementation of the ICBEAU-19. Special thanks to our respected keynote speakers; Morio Tsukada Ph.D. from Mie University, Japan, Prof. Dr. Asmah Awal from University Teknologi MARA-Malaysia, Dr. Duong Van Nha from Kien Giang University-Vietnam, and of course our soil scientist Prof. Ir. Dian Fiantis, MSc. Ph.D. from agricultural faculty Andalas University-for their collaboration and their kindness to share their experience and their expertise in the ICBEAU-19. Many, many thanks also addressed to the Chairman of Cooperation Agency for State Universities in the Western Region (BKS-PTN Wilayah Barat), and Cooperation Agency for State Universities of Agricultural in the Western Region, Rector of Universitas Andalas, all sponsors including PT Indolab, PT Merck Indonesia, CV Mutiara, The West Sumatra Tourism Office, and The Institute of Research and Community Service Andalas University also all parties and valuable participants that could not be mentioned in this opportunity.
Finally, we hope the ICBEAU-19 is not the last our meeting event, but it should be the beginning for our interesting another future meeting under the ICBEAU management

Regards,

Chairman of ICBEAU-19

Prof. Dr. sc. agr. Ir. Jamsari, MP.

Peer review statement

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Peer review statement

All papers published in this volume of *IOP Conference Series: Earth and Environmental Science* have been peer reviewed through processes administered by the proceedings Editors. Reviews were conducted by expert referees to the professional and scientific standards expected of a proceedings journal published by IOP Publishing.

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Agronomy, Plant Breeding, and Plant Utilization

012001

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Growth and productions of crossing between brown rice accessions and submergence rice variety of Inpara 5

M Hasmeda, R Rujito, A Suwignyo, H Hamidson and M F Akbar

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E Mayura and H Idris

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Embryogenic callus induction of coffee [*Coffea arabica* L.] on several plant growth regulator concentration and incubation temperature

R B Setiawan, M Rahmah, H Trisnia, I Chaniago, L Syukriani, R Yunita and J Jamsari

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P Dwinanda, S Syukur and I Suliansyah

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Analysis of genetic diversity of Arabica coffee *[Coffea arabica* L.] in Solok Regency by SRAP molecular markers
R Yunita, M Oktavioni, I Chaniago, L Syukriani, M A Setiawan and J Jamsari
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L Syukriani, A Asben, I Suliansyah and J Jamsari
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N Nelly, R Reflin and Y A Hidayat

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Toxicity of *Bacillus thuringiensis* Berl. KJ3P1 and DLM isolates towards pest of oil palm *Oryctes rhinoceros* [Coleoptera: Scarabaeidae]

Y Pujiastuti, S Sandi, A Arsi and D P Sulistyani

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M Busniah, M Kasim and W Winarto

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S Suwinda, W Wilyus and N Novalina

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Effect of biochar from young coconut waste to improve chemical properties of ultisols and growth coffee [*Coffea arabica* L.] plant seeds

H Herviyanti, A Maulana, S Prima, A Aprisal, S D Crisna and A L Lita

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Soybean seed [*Glycine max* L.] coated by fertile soil-applied sodium bicarbonate at alluvial soil

J Jamilah, N Irawan, A S Thesiwati and M Ernita

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Analysis of export performance and export competitiveness trade of crude palm oil [CPO] industry in Indonesia with RSPO in India and United States markets

H Ali, S Karimi and R Febriamansyah

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R S Siregar, D R Pulungan, L Khairani and S Lubis

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S Samadi, S Wajizah and A Tarman

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S D Anggraeni, H Husmaini, S Sabrina, Z Zulkarnain and E Rossi

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Identification of listeriosis and potency of antimicrobial probiotics by *in vitro* test on beef cattle

N M Siregar, E Purwati and S N Aritonang

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N Sari, H Purwanto, I Suliansyah and E Purwati

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Influential factors of animal food consumption in West Sumatera Province [application of almost ideal demand system model]

A P Ermanda, J Jafrinur and J Hellyward

Soybean seed [*Glycine max* L.] coated by fertile soil-applied sodium bicarbonate at alluvial soil

Soybean seed [*Glycine max* L.] coated by fertile soil-applied sodium bicarbonate at alluvial soil

J Jamilah[1*], N Irawan[1], A S Thesiwati[1], and M Ernita[1]

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Abstract. Soybean yields in Indonesia tend to be low, on average <1.5 Mg ha^{-1} and many of the needs are met through soybean imports. The purpose of this study was to determine the effect of seed coating and sodium bicarbonate on the growth and yield of soybeans in alluvial soils. The experiment was carried out at Alluvial soil in Padang, with an altitude of 10 m above sea level. The experiments were arranged in a completely randomized design in the factorial form. The first-factor was the application of coating material to soybean seeds consisting of 2 levels; uncoated and coated. The second factor was the application of sodium bicarbonate in the leaves of the plant consisting of 4 concentrations; 0%; 0.125%; 0.250% and 0.375%, with 3 replications. Data were analyzed statistically using F-tests 5% significance level. If the treatment had a significant effect, it will continue using the LSD test 5% significance level. The parameters of observations were made; plant height when the generative phase, the number of primary branches, the number of nodules, the number of pith pods, the weight of 100 seeds, dry weight of seeds per plot. The result showed that the application of coating materials on soybean seeds and 0.125% sodium bicarbonate sprayed on the leaves increase the growth and yield of soybean Anjasmoro variety with the highest seed yield was 1.90 Mg ha^{-1}.

1. Introduction

Soybean production in Indonesia is still low at an average of 1.5 Mg ha-1[1]. The original habitat of soybean crops. Soybeans will grow well in temperate or sub-tropical climates [2] stating that low soybean yields are also caused by one of them because technological innovation is still low. Nowadays, Indonesia imports soybeans 70% of the soybean demand, and the rest is produced domestically.

One of the simple technologies developed is making a coat for soybean seeds using ex soybean's soil, manure enriched with nutrients P and K. Results of the study [3] had proven that giving coated [1kg of topsoil + 1kg compost + 100 g lime + 0.5 kg of ex soybean's soil + 10 g PK fertilizer] increase soybean yield per plant not accompanied by the application of Unitas Super liquid organic fertilizer, and vice versa soybean crops that get a positive response to POC will grow well if the seeds are not coated. In this experiment, coated material was made no longer using topsoil and lime, but only a mixture of former soybean soil, manure, SP36, and KCl fertilizer. The possibility of the results could be better than previous experiments and the response of liquid fertilizer was also accompanied by coated seed. It is expected that with the application of the coating, the seeds come into direct contact with bacteria originating from soybean former soils, get complete nutrition, sufficient oxygen, thereby increasing the ability to grow seeds in alluvial soils.

The application of organic liquid fertilizer derived from organic waste materials has been successfully applied to various plants, including; pruned lowland rice [4-6]. In general, they proved that the organic liquid fertilizer has a very positive effect on increasing crop yield, although the recommended concentration of application is not the same. Another effort to increase the fertility of soybean plants is by spraying sodium bicarbonate [baking soda] into the leaves of the plant. According to [7] giving 1 tablespoon of baking soda mixed with 2.5 tablespoons of oil dissolved in 1 gallon of water sprayed on the leaves of plants is good for horticultural plant growth. Sodium bicarbonate is effectively used as a control of fungal diseases in plants, black spots, powdery mildew, but must be careful in large amounts of use can have a negative effect on growth and yield. [8] Explained that by increasing the concentration of application from 0 to 0.35% sodium bicarbonate, sodium, sodium carbonate, sodium chloride and sodium sulfate to soil influence to reduce the growth of wheat germination. If the limit of tolerance for the wheat seedling is taken as the point of concentration when both germination and growth are prevented, this is found to be with the carbonate 0.13 percent, with sodium chloride 0.52 percent, and with sodium sulfate 0.56 percent. It is not clear why there was so little difference in these experiments between the limit of tolerance for sodium chloride and sodium sulfate. However, it is still unknown if sodium bicarbonate that was sprayed on the leaves can act as a substitute for nutrient needs, protect plants from pest and disease disorders or have a negative effect on soybean plants. The purpose of this study was to determine the effect of seed coating and sodium bicarbonate application on the growth and yield of soybeans in alluvial soils.

2. Materials and Methods

2.1. Location and plant materials

Experiments have been carried out in Alluvial, Kalumbuk village, Padang City with altitude at 10 m above sea level. Some materials used in this experiment included; The soybean seeds used are Anjasmoro varieties, coating materials, and sodium bicarbonate. The seed coating material is formed from the mixture 49% ex soybean's soil: 49% composted manure: 1% Potassium: 1% Phosphorus. All materials in a dry air condition are then mashed and sieved at a 2 mm diameter sift, evenly mixed which is called a coating material. Application of coating materials and seed by a ratio 1: 1.

2.2. Experimental design

The experiments were arranged in a completely randomized design in the factorial form. The first-factor was the application of coating material to soybean seeds consisting of 2 levels; without being coated and coated. The second factor was the application of sodium bicarbonate in the leaves of the plant consisting of 4 concentrations; 0%; 0.125%; 0.250% and 0.375%, with 3 replications. Data were analyzed statistically using F tests 5% significance level. If the treatment had a significant effect, so it will continue using the LSD test 5% significance level. Soybeans planted with a spacing of 30 x 15 cm with a plot size of 150 cm x 150 cm. Basic fertilizer given for each hectare was 25 kg of Urea; 150 kg SP36 and 100 kg KCl.

2.3. Procedures and observations

Application of coating materials to soybean seeds by soaking the soybean seeds for 1 night, then the seeds coated with coating materials according to the treatment described above. The coating was applied until all ingredients evenly attached to the seed. Planting is done as much as 1 seed per planting hole as deep as 3 cm. The application of sodium bicarbonate starts at 2nd weeks after planting the seeds every 2 weeks and stops until the plants achieve the generative phase. The parameters of observations made included; plant height when the generative phase, the number of primary branches, the number of nodules, the number of pith pods, the weight of 100 seeds, dry weight of seeds per plot.

3. Results and Discussion

3.1. The effect of soybean seed coating and sodium on plant growth

The results of the experiment showed that there was a single effect of each of the soybean seed coating material and the concentration of sodium bicarbonate on height, but did not significantly affect the number of primary branches of the plant at 45 days after planting. The interaction of coating and sodium bicarbonate is seen in the formation of nodules, presented in Table 1.

Table 1. The effect of coating on soybean seeds and sodium bicarbonate on plant growth

Plant height at 45 days after planting [cm]					
treatments	Sodium bicarbonate concentration [%]				
Seed treatments	0	0.125	0.250	0.375	Average
uncoated	88.22	94.78	95.00	96.44	93.61 b
coated	97.67	98.44	99.44	99.44	98.75 a
Average	92.95 b	96.61 a	97.22 a	97.94 a	
CV [%]	2,68				
the number of primary branches per plant					
Treatments	Sodium bicarbonate concentration [%]				
Seed treatments	0	0.12	0.25	0.37	Average
uncoated	4.33	3.70	4.00	3.33	3.83
coated	3.33	3.67	4.00	4.00	3.75
Average	3.83	3.67	4.00	3.67	
CV[%]	15.23				
the number of nodules per plant					
Treatments	Sodium bicarbonate concentration [%]				
Seed treatments	0	0.125	0.250	0.375	Average
uncoated	6.67 Bb	7.00 Bb	9.00 Aa	8.33 Aab	
coated	10.67 Aa	10.00 Aa	8.00 Ab	9.00 Aab	
Average					
CV [%]	15.41				

The numbers followed by the same uppercase letters are not significant in the column and the numbers followed by the same lowercase letters are not significantly different in the lines according to the LSD level of 5%.

Plant growth was better in the treatment given coated than those not given coated. This shows that coated has a positive role in the seed from the germination process to high growth to the generative phase. Coating given is a nutritious material so that the seeds get enough food starting from the early budding phase to the mature phase. Adequate nutrition which obtained from manure and elements of P and K which are formulated in the form of coating preparations has provided sufficient nutrition for

soybean plants. It was also explained by [9] that at the laboratory scale seeds that were treated with lime material or other nutritional promote better germination growth than seeds uncoated.

In general, the application of sodium bicarbonate sprayed into the plant had a positive effect on plant height, but each concentration given from 0.125% to 0.375% was not significantly different. Sodium bicarbonate contains sodium and bicarbonate. Sodium plays a role in replacing the position of potassium in metabolism because of the same prevalent one. The general role of sodium in low concentrations can be an enzyme activator as well as, the same role as the K element [10]. They explained that potassium and sodium are both involved in enzyme activity. [11] explains that fertilization through leaves is more effective than giving it through the soil. The penetration of nutrients is through the surface leaf layers and their uptake across the plasma membrane of the epidermal cells. Also, environmental factors, aspects of plant biology and solution properties had a crucial effect on the efficiency of foliar fertilization, are presented. In general, the movement of low molecular weight solutes [organic acids, amino acids, sugars] from the leaf surface to the cell wall of the epidermis is a non-metabolic process that is driven by diffusion and electrochemical potential formed by an increase in negative charge across the cuticle membrane.

There was no significant effect of the seed coating treatment or the application of sodium bicarbonate to soybean leaves on the number of primary branches. The nature of the formation of primary branches is more dominated by the genetics of these plants. In general, Anjasmoro varieties produce several primary branches ranging from 2.9 and 5.6 [12].

The formation of nodules was influenced by salute and sodium bicarbonate preparations. Giving coated had a direct impact on the formation of nodules. Root nodules enhanced 50-80% at seed coated compared to an uncoated seed. The same thing had been proven by [3] that the formation of nodules was strongly influenced by the inoculation of *Rhizobium bacteria* in the form of legum or using soybean soil. Likewise, previously [13] reported that the presence of Rhizobacteria in the soil, enhance N fixation from the air to reduce the need for N nutrients and enhance soybean yields. The number of root nodules decreases as the concentration of sodium bicarbonate application increases at seed coated, but this does not occur in uncoated seeds. Negative effects begin to appear if the sodium bicarbonate concentration was increased to 0.250%. The negative effects of sodium application had also been explained [14] on wheat crops, and [8] sugar beet plants. However, these impacts vary depending on the type of plant, soil, and environment.

3.2. The effect of coating on soybean seeds and sodium bicarbonate on soybean yield components

Coating and sodium bicarbonate application did not have a significant effect on the number of seeds per pod, weighing 100 seeds, but there were interactions between the two treatments on seed yield per hectare, presented in Table 2.

Giving coated materials on seeds and 0.125% sodium bicarbonate gave the highest yield of soybean to the dry weight at 14% water content, but it was not significantly different at the same concentration uncoated. The results of this experiment proved that coating is important so that soybean plants become more vigorous and healthier so that they can produce high. Likewise, the application of sodium bicarbonate every 2 weeks until it reached the generative phase had a positive effect on the formation of dried soybeans. [2] which stated that soybean yield did not reach 2 Mg ha^{-1}, still could not be improved in this experiment. Whenever, compared to plants that were not coated, the application of a coating to soybean seeds only enhanced 1%. This due to the fact that the alluvial soils tested are indeed very low in organic matter content which characterized as bright yellow and the soil tends to be compact. The condition of lack of organic matter in the soil also affects the growth and development of *Rhizobium* bacteria in the soil so that it has an impact on yields that increase significantly [15]; explained that the diversity of microorganisms is largely determined by the chemical and physical properties of the soil.

Acidic and compact soil will reduce the presence of N-fixing bacteria so that the element is not easily accessed by the roots. The results of this experiment were still higher than the results [13] which obtained the dry seeds of Wilis variety only 1,026 Mg ha^{-1} from 10 Mg ha^{-1} compost and 100 kg ha^{-1}

nitrogen fertilizer application. According to the descriptions of Wilis and Anjasmoro varieties, the yield potential is almost the same.

Table 2. The effect of coating on soybean seeds and sodium bicarbonate on soybean yield components

The number of pith pods per plant					
Seed treatments	Sodium bicarbonate concentration [%]				
	0	0.125	0.250	0.375	Average
uncoated	109.44	108.22	113.44	109.89	110.25
coated	101.11	114.22	98.00	98.56	102.97
Average	105.28	111.22	105.72	104.22	
CC [%]	10.75				
the weight of 100 seeds					
Seed treatments	Sodium bicarbonate concentration [%]				
	0	0.125	0.250	0.375	Average
uncoated	9.63	9.42	10,45	8.74	9.56
coated	9.25	10.55	9.21	9.49	9.63
Average	9.44	9.98	9.83	9.11	
CC [%]	9.73				
the dry weight of seeds per hectare [Mg]					
Seed treatments	Sodium bicarbonate concentration [%]				
	0	0.125	0.250	0.375	Average
uncoated	1.75Aab	1.88Aa	1.85Aa	1.57 Bab	1.76
coated	1.78 Aab	1.90Aa	1.35Bc	1.66 Abc	1.67
Average	1.76	1.89	1.60	1.61	
CC [%]	9.66				

The numbers followed by the same uppercase letters are not significant in the column and the numbers followed by the same lowercase letters are not significantly different in the lines according to the LSD level of 5%.

4. Conclusion

Application of coating materials on soybean seed and 0.125% sodium bicarbonate sprayed on the leaves increase the growth and yield of soybean Anjasmoro variety with the highest dry seed was 1.90 Mg ha^{-1}.

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