Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 5475 - 5483
Received 25 April 2021; Accepted 08 May 2021.

Growth, Yield and Heavy Metal Content of Corn Kernels on Peat Soil Ameliorated with Various Industrial Wastes

Marlina[1*]
Faculty of Agriculture, Universitas Islam Indragiri, Indonesia
Email: marlinaunisi@gmail.com

Muhammad Arpah[2]
Faculty of Agriculture, Universitas Islam Indragiri, Indonesia
Email : arpahm6@gmail.com

Yoyon Riono[3]
Faculty of Agriculture, Universitas Islam Indragiri, Indonesia
Email: yoyonriono353@gmail.com

***Corresponding author:**
Marlina [1]*
Faculty of Agriculture, Universitas Islam Indragiri, Indonesia
Email: marlinaunisi@gmail.com

ABSTRACT
This study aims to obtain the best formulation of various industrial wastes in increasing growth and yield and to determine whether or not there is uptake of heavy metals by corn kernels Pertiwi-3 and NK-212 varieties on peat soils. The study used a split plot design, as the main plot was varieties (Pertiwi-3 and NK-212 varieties), as subplots was an ameliorant formulation consisting of 6 treatments, (60% OPEFB + 20% ATKS + 10% dregs + 10% fly ash, 60% OPEFB + 10% ATKS + 20% dregs +10% fly ash, 60% OPEFB + 10% ATKS + 10% dregs + 20% fly ash, 40% OPEFB + 30% ATKS + 10% dregs + 20% fly ash, 40% OPEFB + 20% ATKS + 30% dregs + 10% fly ash and 40% OPEFB + 10% ATKS + 20% dregs + 30% fly ash), each treatment combination was repeated 3 times. Data from the observations of each parameter were analyzed statistically using analysis of variance and continued with the BNJ test at the 5% level. The results showed that all tested ameliorant formulations showed high yields of both high maize varieties on peat soils, even large and long cobs, straight seed rows with the number (14-16) ear rows and uniform plant diversity as described. The uptake of heavy metal lead (Pb), namely 0.02 - 0.11 µg / g, was very low, while cadmium (Cd) was not found in the seeds of the two maize varieties that were applied to the 6 formulations.

Keywords: Varieties, Corn, Industrial Waste, Heavy Metals, Peat Soil

Introduction
The need for feed continues to increase every year, especially poultry requires 50% of corn as feed material, therefore the need for corn also increases. Potential of peat. for the development of maize is very large because it is quite extensive, namely about 3.8 million ha found in Riau and has not been used optimally, but has chemical constraints. Peat chemical constraints can be overcome by applying ameliorant. Various industries in Riau leave by-products (waste) which can be formulated into ameliorant for peat. Among them, the palm oil processing industry leaves Oil Palm Empty Bunches (PEB) and the pulp and paper industry leaves dregs and fly ash. The

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 5475 - 5483
Received 25 April 2021; Accepted 08 May 2021.

three remaining ingredients contain complete nutrients (macro and micro nutrients)(Arpah, Marlina, and Apriyanto 2020; Marlina et al. 2020). OPEFB compost contains high potassium (K), namely 4-6%, and other nutrients such as phosphorus (P); 0.2–0.4%, Nitrogen (N); 2–3%, Calcium (Ca); 1–2%, Magnesium (Mg); 0.8–1.0% and C / N; 15.03%(Ahmad et al. 2021; Apriyanto et al. 2021; Asyary and Veruswati 2020; Megatsari et al. 2020), Oil Palm Bunch Ash (ATKS) can increase soil pH and have a significant effect on increasing levels of interchangeable potassium (k-dd)(Apriyanto and Umanailo 2019; Djalante et al. 2020; Muharlisiani et al. 2019). Fly ash contains nutrients needed by plants such as zinc (Zn), Ca, Mg, K and P, so that it can meet the nutrient needs of plants. The dominant elements in dregs are CaO as much as 48.47%, SiO2; 3.36%, Al2O3; 3.38%, and Fe2O3; 0.046%. The complete nutrient requirements needed by plants can be fulfilled by formulating or mixing these ameliorants. The ameliorant formulation is expected to meet every plant nutrient requirement, because the different nutrient content of each ameliorant can complement each other, so that the nutrient needs needed by plants on peat soil can be met.

This study aims to obtain the best formulation of various industrial wastes in increasing growth and yield and to determine whether or not heavy metal uptake by Pertiwi-3 and NK-212 corn kernels on peat soils ameliorated with various ameliorant formulations.

Methods

This research was conducted in Tembilahan Hulu Village, Tembilahan Hulu Subdistrict, Indragiri Hilir Regency, Riau Province, from May to September 2015. Soil and ameliorant analysis was carried out at the Laboratory of Soil Science, Faculty of Agriculture, Riau University, and analysis of OPEFB compost at the Laboratory of PT. Sarana Inti Pratama Pekanbaru. Materials used: hemic type peat soil, corn seeds of Pertiwi-3 and NK-212 varieties, OPEFB compost, ATKS, as well as dregs and fly ash. Urea fertilizer, SP-36 and KCl. Regent 50 EC and Dhithane M-45. The tools used are AAS and Spectrophotometer, pH meter, digital scales, calipers and rulers. (KMS. Novyar Satriawan Fikri and Azhar 2020; Supriatna 2020; Susilawati, Falefi, and Purwoko 2020).

The study used a split plot design, as the main plot was varieties (Pertiwi-3 and NK-212 varieties), as subplots was an ameliorant formulation consisting of 6 treatments, (60% OPEFB + 20% ATKS + 10% dregs + 10% fly ash, 60% OPEFB + 10% ATKS + 20% dregs +10% fly ash, 60% OPEFB + 10% ATKS + 10% dregs + 20% fly ash, 40% OPEFB + 30% ATKS + 10% dregs + 20% fly ash, 40% OPEFB + 20% ATKS + 30% dregs + 10% fly ash and 40% OPEFB + 10% ATKS + 20% dregs + 30% fly ash), each treatment combination was repeated 3 times. Data from the observations of each parameter were analyzed statistically using analysis of variance and continued with the BNJ test at the 5% level. The parameters observed were the number of seeds per row, the number of rows of seeds per ear, dry shelled weight and heavy metal analysis on the seeds of both maize varieties (Setiati and Azwar 2020; FSB 2020; Niles et al. 2020; Susilawati et al. 2020).

Results and Discussion

Chemical Properties of Research Soil

Table 1 shows that the pH of the peat soil used is included in the acid criteria, due to the high content of H + ions from the organic acids that make up the peat, especially in the carboxylic (-COOH) and phenolic (C6H4OH) groups. The content of C-organic, N-total and the ratio of C / N are classified as very high, so that N is not available for plants because N is still the organic

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 5475 - 5483
Received 25 April 2021; Accepted 08 May 2021.

material that makes up peat. Harrison et al. (2020) stated that if the total N content, high organic C and C / N ratio is also high, it means that N is a constituent of peat organic matter and is not available for plants.

Table 1 shows that the pH of the peat soil used is included in the acid criteria, due to the high content of H + ions from the organic acids that make up the peat, especially in the carboxylic (-COOH) and phenolic (C6H4OH) groups. The content of C-organic, N-total and the ratio of C / N are classified as very high, so that N is not available for plants because N is still the organic material that makes up peat. Harrison et al. (2020), stated that if the total N content, high organic C and C / N ratio is also high, it means that N is a constituent of peat organic matter and is not available for plants.

The total P element is classified as high, this is because total P is still in the form of organic P in the organic matter that makes up peat. The available phosphorus is classified as moderate, this is because the peat used is in hemic maturity so that only part of the organic material has undergone decomposition, besides that P is a nutrient available in the form of anions (H2PO4- and HPO42-) so that it is easily washed or leached. (Fang and Song 2021).

The contents of Ca-dd, Mg-dd and Na-dd were classified as low and very low, medium K-dd, very high CEC and very low KB. This is caused by the dissociation of carboxyl groups which release H + into the solution and the colloid so that it becomes negatively charged.(Chandra, Gupta, and Agarwal 2020; Fang and Song 2021). Marlina et al. (2020); Riono and Apriyanto (2020) states that the high CEC is caused by peat colloids which are negatively charged, and contain lots of organic acids with carboxyl and phenolic groups. The higher the carboxyl and phenolic groups, the higher the CEC of the peat soil. Peat soils are characterized by a very high CEC, but the percentage of family planning is very low, which makes it difficult to absorb nutrients, especially alkalis needed by plants.

Table 1. Chemical Properties of Research Soil

Sifat Kimia	Nilai	Kriteria
pH H_2O	4,84	Sour
pH KCl	3,92	Sour
C Organic (%)	30,24	Very high
N-Total (%)	1,30	Very high
C/N	23,26	Very high
P Total (g/kg)	0,51	high
K Total (g/kg)	0,77	Very high
P Tersedia (g/kg)	0,26	Middle
Cation basa (NH_4OAc pH 7)	1,86	Very low
Ca-dd (Cmol/kg)	0,53	low
Mg-dd (Cmol/kg)	0,32	Middle
K-dd (Cmol/kg)	0,07	Very low
Na-dd (Cmol/kg)	97,8	Very high
KTK (Cmol/kg)	2,84	Very low
KB (%)		

Note. The criteria refer to the soil research center (Bogor Soil Laboratory, 1983).

Table 2 shows the results of laboratory analysis of the pulp and palm oil industry waste which has a high nutrient content so that it has the potential to be used as ameliorant for improving peat soil. This was also stated by Marlina et al. (2020) that a very high CEC value but low family planning would hamper the supply of nutrients, especially K, Ca and Mg.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 5475 - 5483
Received 25 April 2021; Accepted 08 May 2021.

Table 2. Results of Chemical Properties Analysis of Ameliorants

Parameter	Chemical Properties			
	EFB	**AFB**	***Dregs***	***Fly ash***
pH H_2O	7,4	10,7	9,3	12
C-Organik	17,8 %	4,61 %		
C/N	10			
N-Total	1,77 %	0,14 %		
P-Total		1,31 g/kg		
K Total				
P_2O_5	27,1 g/kg		2 g/kg	3,6 g/kg
K_2O	25,2 g/kg	54,5 g/kg	3,1 g/kg	9,9 g/kg
CaO	11,2 g/kg		410 g/kg	66,7 g/kg
MgO	4,5 g/kg		239 g/kg	8,2 g/kg
Na			268 g/kg	2,3 g/kg
S			7,2 g/kg	5,8 g/kg
Cl			14,1 g/kg	0,06 g/kg
Fe			5 g/kg	19,0 g/kg
Mn			0, 99 g/kg	0,45 g/kg
Cu			0.13 g/kg	0.03 g/kg
Zn			0,22 g/kg	0,05 g/kg
Co			0.002 g/kg	0,012 g/kg
Mo			0,001 g/kg	0,0015 g/kg
Ba			0, 35 g/kg	0,05 g/kg
Cd			0,0002 g/kg	0,014 g/kg
Cr			0,167 g/kg	0,061 g/kg
Ni			0, 099 g/kg	0,043 g/kg
Pb			0,009 g/kg	0,006 g/kg
Se			0.36 g/kg	< 0,001 g/kg

General principles of government that are appropriate to serve as the basis for the procedure proper administration of government thus administration government to be good, fair, polite, free from injustice, violation of regulations, abuse of power, and arbitrary actions. Something government decisions / decrees that are contrary to the principles of governance feasible means contrary to legal regulations.

1. Soil Reaction

The highest pH increase tends to occur in the F6 formulation with the highest dregs and fly ash composition, namely 20% dregs and 30% fly ash. This is due to the presence of lime in the dregs and fly ash which is quite high in the form of CaO, respectively 410300 mg / kg and 66700 mg / kg. Table 3 shows that various ameliorant formulations on peat soils planted with maize Varieties Pertiwi-3 and NK-212 did not significantly increase the pH compared to the initial pH (4.84), the increase in pH was only in the range of 0.04 - 0.36.

Table 3. pH (H2O) Value of Peat Soil Applied in Various Ameliorant Formulations After Harvesting Maize Varieties Pertiwi-3 and NK-212

Ameliorant Formulation	pH (H_2O)
60 % EFB + 20 % AFB + 10 % *dregs* + 10 % *fly ash)*	4,88
60 % FEB + 10 % AFB + 20 % *dregs* + 10 % *fly ash)*	4,97
60 % FEB + 10 % AFB + 10 % *dregs* + 20 % *fly ash)*	5,06
40 % FEB + 30 % AFB + 10 % *dregs* + 20 % *fly ash)*	5,08
40 % FEB + 20 % AFB + 30 % *dregs* + 10 % *fly ash)*	5,02
40 % FEB + 10 % AFB + 20 % *dregs* + 30 % *fly ash)*	5,20

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 5475 - 5483
Received 25 April 2021; Accepted 08 May 2021.

The very high content of CaO is a source of Ca, because CaO is very effective in increasing soil pH as a substitute for lime. The results of Ermanita et al. (2004) showed that pulp & paper waste is an effective material in increasing pH as a substitute for lime, because the Ca element contained by pulp & paper waste can improve the environment for plant growth.

2. Production potential

The production potential is measured by counting the number of seeds per line, the number of rows of ear seeds, the weight of dry shelled seeds. Table 4 shows the results of potential maize production in all treatments.

Table 4. Potensial Maize Production

Main Plot	Plot research	Parameter
		Number of Seeds Per Row (seeds)
Pertiwi-3	60 % EFB + 20 % AFB + 10 % *dregs* + 10 % *fly ash)*	37,67 a
	60 % FEB + 10 % AFB + 20 % *dregs* + 10 % *fly ash)*	32,33 a
	60 % FEB + 10 % AFB + 10 % *dregs* + 20 % *fly ash)*	35,67 a
	40 % FEB + 30 % AFB + 10 % *dregs* + 20 % *fly ash)*	34,67 a
	40 % FEB + 20 % AFB + 30 % *dregs* + 10 % *fly ash)*	33,67 a
	40 % FEB + 10 % AFB + 20 % *dregs* + 30 % *fly ash)*	35,33 a
PU Varieties		34,89 b
NK-212	60 % EFB + 20 % AFB + 10 % *dregs* + 10 % *fly ash)*	37,00 a
	60 % FEB + 10 % AFB + 20 % *dregs* + 10 % *fly ash)*	36,00 a
	60 % FEB + 10 % AFB + 10 % *dregs* + 20 % *fly ash)*	37,00 a
	40 % FEB + 30 % AFB + 10 % *dregs* + 20 % *fly ash)*	34,67 a
	40 % FEB + 20 % AFB + 30 % *dregs* + 10 % *fly ash)*	35,00 a
	40 % FEB + 10 % AFB + 20 % *dregs* + 30 % *fly ash)*	34,67 a
PU Varieties		35,72 a

Note. Numbers in the same column followed by lowercase letters that have a significant effect according to the BNJ test at the 5% level.

Increased nutrient availability will increase nutrient uptake by plants, so that photosynthesis takes place perfectly and will spur physiological processes and plant metabolism, so that it will produce good cob photosynthate. Busfayuta (2004) states that ear growth is highly dependent on the rate of photosynthetic activity. Lakit (2000) adds that plants can absorb nutrients well, if enough nutrients are provided, so that plants can grow and produce well.

The availability of P and K elements which are quite high from the four ameliorants given can increase the growth of maize, because these elements are important in the formation of maize seeds. Element P functions for ATP growth including seed formation, while K stimulates the translocation of photosynthetic products from leaves to other parts of the plant and plays a role in the formation of carbohydrates, thereby increasing the number of seeds of the maize plant. P elements are also used by plants for cellular metabolic processes, so that the photosynthesis process takes place. Table 5 shows that the application of various ameliorant formulations to peat soils planted with Pertiwi-3 and NK-212 maize varieties gave the same effect on the number of seed rows per ear.

Table 5. Number of Rows of Biji Per Cobs with Corn-Weighted Varieties Pertiwi-3 and NK-212, On Peat Soil Applied With Various Amelioran Formulations

Main Plot	Plot research	Parameter
		Number of Seed Rows Per Cob (rows)
Pertiwi-3	60 % EFB + 20 % AFB + 10 % *dregs* + 10 % *fly ash)*	15,00 a
	60 % FEB + 10 % AFB + 20 % *dregs* + 10 % *fly ash)*	15,33 a
	60 % FEB + 10 % AFB + 10 % *dregs* + 20 % *fly ash)*	15,00 a
	40 % FEB + 30 % AFB + 10 % *dregs* + 20 % *fly ash)*	15,33 a
	40 % FEB + 20 % AFB + 30 % *dregs* + 10 % *fly ash)*	16,00 a

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 5475 - 5483
Received 25 April 2021; Accepted 08 May 2021.

	40 % FEB + 10 % AFB + 20 % *dregs* + 30 % *fly ash)*	15,33 a
PU Varieties		15,33 a
NK-212	60 % EFB + 20 % AFB + 10 % *dregs* + 10 % *fly ash)*	13,33 a
	60 % FEB + 10 % AFB + 20 % *dregs* + 10 % *fly ash)*	14,00 a
	60 % FEB + 10 % AFB + 10 % *dregs* + 20 % *fly ash)*	15,00 a
	40 % FEB + 30 % AFB + 10 % *dregs* + 20 % *fly ash)*	16,67 a
	40 % FEB + 20 % AFB + 30 % *dregs* + 10 % *fly ash)*	14,00 a
	40 % FEB + 10 % AFB + 20 % *dregs* + 30 % *fly ash)*	14,67 a
PU Varieties		14,61 b

Note. Numbers in the same column followed by lowercase letters that have a significant effect according to the BNJ test at the 5% level.

The availability of P and K elements which are quite high from the four ameliorants given can increase the growth of maize, because these elements are important in the formation of maize seeds. Element P functions for ATP growth including seed formation, while K stimulates the translocation of photosynthetic products from leaves to other parts of the plant and plays a role in the formation of carbohydrates, thereby increasing the number of seeds of the maize plant. P elements are also used by plants for cellular metabolic processes, so that the photosynthesis process takes place.

Photosynthate produced from photosynthesis can be stored as food reserves in seeds. Carbohydrates produced from the photosynthesis process are transported to other tissue organs to be used by these tissue organs for growth or stored as spare materials such as fruit and seeds (Lakitan, 2000). Novizan (2002) states that lack of P and K elements can cause late fruit maturity and small fruit size, then Lingga (2003) states that P can accelerate fruit aging or seed ripening and increase grain yield. Table 6 shows that the application of various ameliorant formulations to peat soils planted with Pertiwi-3 and NK-212 maize varieties gave the same effect on dry shelled weight.

Table 6. The application of various ameliorant formulations to peat soils planted with Pertiwi-3 and NK-212 maize varieties

Main Plot	**Plot research**	**Parameter**
		Dry Shell Weight (g)
Pertiwi-3	60 % EFB + 20 % AFB + 10 % *dregs* + 10 % *fly ash)*	256,00 a
	60 % FEB + 10 % AFB + 20 % *dregs* + 10 % *fly ash)*	243,33 a
	60 % FEB + 10 % AFB + 10 % *dregs* + 20 % *fly ash)*	201,67 a
	40 % FEB + 30 % AFB + 10 % *dregs* + 20 % *fly ash)*	235,67 a
	40 % FEB + 20 % AFB + 30 % *dregs* + 10 % *fly ash)*	245,33 a
	40 % FEB + 10 % AFB + 20 % *dregs* + 30 % *fly ash)*	232,33 a
PU Varieties		235,72 a
NK-212	60 % EFB + 20 % AFB + 10 % *dregs* + 10 % *fly ash)*	202,33 a
	60 % FEB + 10 % AFB + 20 % *dregs* + 10 % *fly ash)*	207,67 a
	60 % FEB + 10 % AFB + 10 % *dregs* + 20 % *fly ash)*	207,00 a
	40 % FEB + 30 % AFB + 10 % *dregs* + 20 % *fly ash)*	243,00 a
	40 % FEB + 20 % AFB + 30 % *dregs* + 10 % *fly ash)*	252,67 a
	40 % FEB + 10 % AFB + 20 % *dregs* + 30 % *fly ash)*	237,33 a
PU Varieties		225,00 a

Note. Numbers in the same column followed by lowercase letters that have a significant effect according to the BNJ test at the 5% level.

3. Heavy Metal Analysis.

Pb metal in this study was absorbed in corn kernels but in very small amounts ranging from 0.03 - 0.11 µg / g in Pertiwi-3 varieties and 0.02 - 0.10 µg / g in NK-212 varieties (Table 4.22), and did not exceed the predetermined critical limits (Table 4.23). According to FAO / WHO (1975) and the Directorate General of Drug and Food Control, the maximum Pb content that can be carried in food ingredients is 2 µg / g, while the critical limit of heavy metal Pb in plants is 50

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 5475 - 5483
Received 25 April 2021; Accepted 08 May 2021.

µg / g, so corn is safe for consumption because it is not endanger health. Table 7 shows that the application of various ameliorant formulations to peat soil showed heavy metal Pb uptake in both maize varieties while Cd was not found.

Table 7. Heavy Metal Uptake in Corn Varieties Pertiwi-3 and NK-212 Formulated with Various Ameliorants

Ameliorant dosage (kg / ha)	Pertiwi-3		NK-212	
	Pb (µg/g)	Cd µg/g)	Pb (µg/g)	Cd (µg/g)
60 % EFB + 20 % AFB + 10 % dregs + 10 % fly ash)	0,09	td	0,02	td
60 % FEB + 10 % AFB + 20 % dregs + 10 % fly ash)	0,06	td	0,08	td
60 % FEB + 10 % AFB + 10 % dregs + 20 % fly ash)	0,11	td	0,10	td
40 % FEB + 30 % AFB + 10 % dregs + 20 % fly ash)	0,03	td	0,06	td
40 % FEB + 20 % AFB + 30 % dregs + 10 % fly ash)	0.08	td	0,08	td
40 % FEB + 10 % AFB + 20 % dregs + 30 % fly ash)	0,07	td	0,10	td

Note. Td = not found.

Table 7 shows that the Pb uptake content in maize is very small, and Cd is not detected. This is because the Pb and Cd content in the dregs and fly ash analysis are very low, namely 0.009 g / kg and 0.006 g / kg, and 0.0002 g / kg and 0.014, so it is suspected that Pb is absorbed in small amounts and Cd is not absorbed in the seeds. corn. Masganti, Anwar, and Susanti (2020) states that small amounts of Pb can be absorbed by plant roots, but its translation from the roots is blocked by the chemical physical processes involved in the binding of Pb, so it tends to accumulate in the root cell walls. This causes Pb to not be translocated from the roots even though it can be absorbed by the roots of the maize plant, because its transport to the young cobs and seeds is blocked.

The Cd metal in the soil solution will be absorbed by the plant roots, then translocated to the stems, leaves and even to the fruit. In this study, Cd metal was not found in corn kernels, this is because apart from the small Cd content in dregs and fly ash, it is also suspected that Cd is more concentrated in the stems and leaves. Riono and Apriyanto (2020) found that the highest concentration of Cd was in the leaves and stems of rice, but the amount in the grain portion was very small. Arpah et al. (2020) stated that the influence of other metals such as Zn in the soil can interfere with the absorption of Cd by plants.

Apart from the small Pb and Cd metal content in dregs and fly ash, it is also caused by the influence of the planting medium, namely peat soil, where the organic fraction of peat soil can chelate metals. In addition, the contribution of organic materials from ameliorants also has an effect on metal absorption because organic materials can chelate metals. Tan (1993) states that the organic fraction of peat soils in Indonesia is more than 95%, less than 5% of the remainder is the inorganic fraction, thus peat soil has the ability to chelate metals. According to Marlina et al (2020) that the Critical Limit of Heavy Metals in Plants is Pb (µg/g), Cd (µg/g), Co (µg/g), Cr (µg/g), Ni (µg/g), Cu (µg/g), Mn (µg/g), Zn (µg/g) consecutive 50, 5 – 30, 15 – 30, 5 – 30, 5 – 30, 20 – 100, and 100 – 400.

Conclusion

The treatment performed showed that what was tested on peat soil gave the same effect as the resulting large and long cob, the number of rows that were neatly arranged and the seeds were fully filled, and the uptake of heavy metal lead (Pb) was 0.02 - 0.11 µg / g was very low, while cadmium (Cd) was not found in the seeds of the two maize varieties that were applied to the 6 formulations.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 5475 - 5483
Received 25 April 2021; Accepted 08 May 2021.

References

1. Ahmad, Hasnawati, Mulyadi, Mulono Apriyanto, A. Oklianda, D. D. Putra, and A. Warmi. 2021. "Student Responses During Online Learning in the Covid-19 Pandemic Period Student Responses During Online Learning in the Covid - 19 Pandemic Period." *Journal of Physics: Conference Series* 1764(1):012125.

2. Apriyanto, M., and M. C. B. Umanailo. 2019. "Decrease Polyphenols, Ethanol, Lactic Acid, and Acetic Acid during Fermentation with Addition of Cocoa Beans Innoculum." *International Journal of Scientific and Technology Research* 8(10):461–65.

3. Apriyanto, Mulono, Partini, Hermiza Mardesci, Gunawan Syahrantau, and Yulianti. 2021. "The Role of Farmers Readiness in the Sustainable Palm Oil Industry The Role of Farmers Readiness in t He Sustainable Palm Oil Industry." *Journal of Physics: Conference Serie* 1764(1):012211.

4. Arpah, Muhammad, Marlina, and Mulono Apriyanto. 2020. "Effect Of Grant Palm Oil Ash To The Growth And Production Of Two Corn Varieties (Zea Mays L) In Peatland." *Int. J. Sci. Technol. Res* 9(4):990–93.

5. Asyary, Al, and Meita Veruswati. 2020. "Sunlight Exposure Increased Covid-19 Recovery Rates: A Study in the Central Pandemic Area of Indonesia." *Science of the Total Environment* 729:139016.

6. Chandra, Geetanjali, Ruchika Gupta, and Nidhi Agarwal. 2020. "Role of Artificial Intelligence in Transforming the Justice Delivery System in COVID 19 Pandemic." *International Journal on Emerging Technologies* 11(3):344–50.

7. Djalante, Riyanti, Jonatan Lassa, Davin Setiamarga, Aruminingsih Sudjatma, Mochamad Indrawan, Budi Haryanto, Choirul Mahfud, Muhammad Sabaruddin Sinapoy, Susanti Djalante, Irina Rafliana, Lalu Adi Gunawan, Gusti Ayu Ketut Surtiari, and Henny Warsilah. 2020. "Review and Analysis of Current Responses to COVID-19 in Indonesia: Period of January to March 2020." *Progress in Disaster Science* 6:100091.

8. Fang, Guirong, and Qunli Song. 2021. "Legislation Advancement of One Health in China in the Context of the COVID-19 Pandemic: From the Perspective of the Wild Animal Conservation Law." *One Health* 12.

9. FSB. 2020. "COVID-19 Pandemic: Financial Stability Implications and Policy Measures Taken - Report Submitted to the G20 Finance Ministers and Governors." (July).

10. Harrison, Mark E., Juliarta Bramansa Ottay, Laura J. D'Arcy, Susan M. Cheyne, Anggodo, Claire Belcher, Lydia Cole, Alue Dohong, Yunsiska Ermiasi, Ted Feldpausch, Angela Gallego-Sala, Adib Gunawan, Andrea Höing, Simon J. Husson, Ici P. Kulu, Siti Maimunah Soebagio, Shari Mang, Lina Mercado, Helen C. Morrogh-Bernard, Susan E. Page, Rudy Priyanto, Bernat Ripoll Capilla, Lucy Rowland, Eduarda M. Santos, Viola Schreer, I. Nyoman Sudyana, Supardi Bin Bakeri Taman, Sara A. Thornton, Caroline Upton, Serge A. Wich, and F. J. Frank Veen. 2020. "Tropical Forest and Peatland Conservation in Indonesia: Challenges and Directions." *People and Nature* 2(1):4–28.

11. KMS. Novyar Satriawan Fikri, and Ali Azhar. 2020. "Academic Study Of District Formation South Indragiri." *PROGRESSIVE LAW REVIEW* 2(1):1–13.

12. Marlina, Intan Sari, Elfi Yenny Yusuf, Yoyon Riono, and Mulono Apriyanto. 2020. "Utilization Of Industrial Waste Pulp And Palm Oil On Growth And Results Of Corn (Zea Mays L) On Peat." *Int. J. Sci. Technol. Res* 9(1):109–12.

13. Masganti, Masganti, Khairil Anwar, and Maulia Aries Susanti. 2020. "Potensi Dan Pemanfaatan Lahan Gambut Dangkal Untuk Pertanian." *Jurnal Sumberdaya Lahan* 11(1):43=52.

14. Megatsari, Hario, Agung Dwi Laksono, Mursyidul Ibad, Yeni Tri Herwanto, Kinanty Putri Sarweni, Rachmad Ardiansyah Pua Geno, and Estiningtyas Nugraheni. 2020. "The Community Psychosocial Burden during the COVID-19 Pandemic in Indonesia." *Heliyon* 6(10):e05136.

15. Muharlisiani, Lusy Tunik, Endang Noerhartati, Karwanto Karwanto, Dina Chamidah, Nugrahini Susantinah Wisnujati, Herfa Maulina Dewi Soewardini, Mulono Apriyanto, Amrozi Khamidi, Riris Andriati, and Dewi Fitriani. 2019. "Public Relations Management through Management by Objective." *Int. J. Sci. Technol. Res* 8(10).

16. Niles, Meredith T., Farryl Bertmann, Emily H. Belarmino, Thomas Wentworth, Erin Biehl, and Roni Neff. 2020. "The Early Food Insecurity Impacts of COVID-19." *Nutrients* 12(2096):1–19.

17. Riono, Yoyon, and Mulono Apriyanto. 2020. "Pemanfaatan Abu Sekam Padi dalam Inovasi Pemupukan Kacang Hijau (Vigna Radiate L) Di Lahan Gambut." *Selodang Mayang: Jurnal Ilmiah Badan Perencanaan Pembangunan Daerah Kabupaten Indragiri Hilir* 6(2):60.

18. Setiati, Siti, and Muhammad K. Azwar. 2020. "COVID-19 and Indonesia." *Acta Med Indones - Indones J Intern Med* 52(1):84–89.

19. Supriatna, Encup. 2020. "Socio-Economic Impacts of the COVID-19 Pandemic: The Case of Bandung City." *Journal of Governance* 5(1):61–70.

20. Susilawati, Susilawati, Reinpal Falefi, and Agus Purwoko. 2020. "Impact of COVID-19's Pandemic on the Economy of Indonesia." *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences* 3(2):1147–56.