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The Germination and Growth of Induced F1 Tomato Seeds By Exposure To 0.2mt of Magnetic Field And Fusarium Sp. Infection

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Abstract: *Exposure of 0.2 mT magnetic field (MF) to tomato seeds is known to increase germination, growth, and resistance of plants to Fusarium sp. In this study, the germination and growth of F1 tomato seeds were tested after reinfection with Fusarium oxysporum f.sp.lycopersici (Fol). The study was arranged factorially in Completely Randomized Design (CRD). The first factor is F1 seed types consisting of 8 types: M_0F_0, M_0F_{60}, M_7F_0, M_7F_{60}, $M_{11}F_0$, $M_{11}F_{60}$, $M_{15}F_0$, and $M_{15}F_{60}$. The numbers after letter M and F indicate that F1 tomato seeds were obtained from parental tomato plants whose seeds were induced by exposure of 0.2 mTMF each for 0, 7'48", 11'44", and 15'36"and then infected by Fusarium sp. monospore suspension each for 0 and 60 minrespectively. The second factor is Fol infection. The data obtained were analyzed variance and followed by Fisher's Test at α = 5%.The results show that the parental tomato seeds induced by 0,2 mT MF produce F1 seeds that have a higher germination percentage and rate as well as dry weight than the parental tomato seeds of control although reinfected by Fol. These results suggest that the vigor properties of the F1 tomato seeds are the same as the vigor properties of the parental seeds.*

Keywords: *F1 tomato seed type, germination rate, Fol, germination percentage, and dry weight*.

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I. Introduction

Tomatoes are known to be highly nutritious, containing vitamins, minerals, and antioxidants that are very beneficial to the human body. Tomatoes are also known as one type of multipurpose horticultural crops and have high economic value therefore widely cultivated.The problem often encountered in the cultivation of tomatoes is the pathogenic microbes attack. One of them is Fusarium oxysporum, a fungus causes Fusarium wilt disease (Bawa, 2016). Fusarium sp. attack can lead to restriction of plant metabolism and ultimately to plant death as a result of damage on the tissues of the xylem causing inhibition of water transport in plants (Semangun, 2004).Thecontrol of Fusarium wilt of tomato is important in maintaining plant vigor andfruit production. Numerous strategies havebeen proposed to control this fungal pathogen. However, Efforts to control Fusarium wilt have experienced limited success due mainly to emergence ofnew pathogenic races. Documented methods that are used in the controlof the disease include cultural, biological, use of resistance, chemical and useof natural products(Bawa, 2016). Meanwhile, until now not yet available tomato cultivars are resistant to Fusarium sp.The magnetic field (MF) is known to affect plant growth. Previous studies have shown that magnetic fields have a positive effect on germination (Hussein et al., 2015; Agustrinaet al., 2013; and Morejon et al., 2007) vegetative growth, and generative growth of tomato plants (Listiani, 2016; Jedlicka et al., 2014; and De souza et al., 2005).The MF also seems to have a role in improving the plant defenses. The MF exposure to old millet seeds enhances germination as well as peroxidase enzyme activity (Hussein et al., 2015). Radhakrisnan and Kumari (2013) demonstrated that the treatment of MF in soybean seeds increased chlorophyll content and enzymes for plant defense such as phosphatase, nitrate reductase, Peroxidase, and polyfenoloxidase. The exposure of 0.2 mT MF to tomato seeds and then infected byFusarium oxysporum (Fox) proved to be able to maintain growth (Agustrina et al., 2016) and production of tomato plants (Listiani, 2016) were even relatively higher than control plants that were not given both MF treatment and Fusarium sp. infection.In this paper we reported the rate and percentage of F1 tomato seed germination as well as the dry weight of F1 tomato plants. The F1 tomato seeds harvested from parental tomato plants whose seeds are exposed to 0,2 mT MF and then infected by a suspension of Fox monospores. The study was perform to study whether the parental tomato seed properties exposed to 0.2 mT MF to germinate and survive better growth against Foxinfection compared to germination and growth of control seeds is derived on the F1 tomato seeds produced.

II. Materials and Method

The F1 tomato seeds used are harvested from the parent plant whose seeds are induced by 0.2 mT magnetic field (MF) and *Fussarium oxyporum* (*Fox*). The study was arranged factorially in Completely Randomized Design (CRD). The first factor is a type of seed consisting of 8 types: M_0F_0, M_0F_{60}, M_7F_0, M_7F_{60}, $M_{11}F_0$, $M_{11}F_{60}$, $M_{15}F_0$, and $M_{15}F_{60}$. The second factor was *Fusarium oxysporum* f.sp *lycopersici*(*Fol*) infection of F1 seed for 0 min (A) as control and 60 min (B).

M_0= parental seedsare not induced by 0.2 mT MF
M_7= parental seeds are induced by 0.2 mT MF for 7 min 48 sec.
M_{11}= parental seeds are induced by 0.2 mT MFfor 11 min 44 sec.
M_{15} = parental seeds are induced by 0.2 mT MFfor 15 min 36 sec.
F_0= parental seeds are not by infected *Fusarium oxysporum* (*Fox*)
F_{60}= parental seeds are infected by *Fox* for 60 min.
A = F1 seeds are not infected by *Fusarium oxysporum*f.sp. *lycicoperci*(*Fol*).
B = F1 seeds are infected by *Fol* for 60 min.

F1 tomato seeds infected with *Fol*) before being germinated by soaking the seeds of F1 in a suspension solution of monospore *Fol* with a density of 1.35x107 monidia/ml for 60 min. The seeds were then germinated for 7 days. The sprouts were transferred to the seedlings medium on the 7th day after germination and left for 14 days. The 21-day-old tomato seedlings were then grown in polybags containing compost-mixed soil medium with a ratio of 3: 1. The parameters observed were germination rate, germination percentage, and dry weight of plant. Observation of rate and percentage of germination conducted since the first day of F1 seeds was germinated to the 7th day after germination. The germination rate is determined based on the first day of sight of sprouted seeds. The percentage of germination was measured on the 7th day after germination and determined by the percentage of the number of F1 seedlings from the total seeds of F1 germinated. The data collection of plant dry weight was done at week-3, week-4, week-5, and week-6 after germination. The data were analyzed using Anova and continued with the test among treatments using Fisher Test at 5% real level.

III. Results and Discussion

The anova results showed that the treatment of F1 type seed resulted in significant differences in germination rate, germination percentage, and dry weight of the plant at week-4 after germination. Fusarium oxysporum f.sp lycopersicum (Fol) infection has only a significant effect on germination rate. The interaction between F1 type seed and Fol infection did not significantly affect all parameters measured.

A. Germination rate and germination percentage

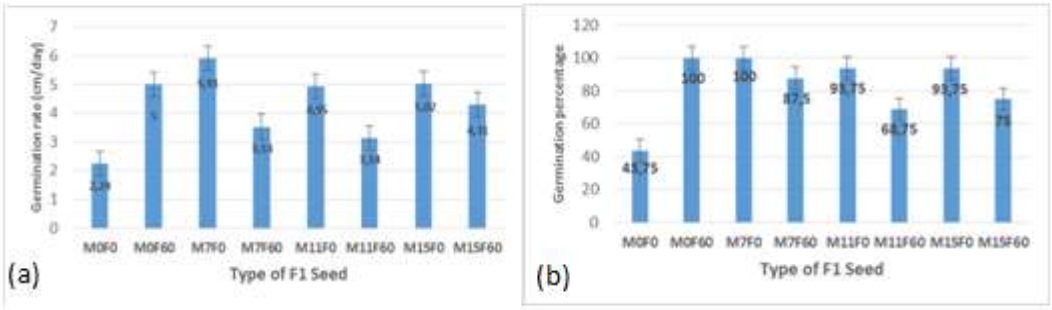

Figure 1. Germination rate (a) and germination percentage (b) of F1 seed induced by 0,2 mT magnetic field and *Fusariumoxysporum* (*Fox*)

The type of F1 tomato seeds significantly results in differences in germination rate and germination percentage. F1 tomato seeds derived from parental tomatoes whose seeds are induced by 0.2 mT magnetic fields (MF) either infected or not infected with *Fusarium oxysporum* (*Fox*) (M_7, M_{11}, and M_{15}) show better vigor due to both germination rates (Fig. 1a) and the percentage of germination (Figure 1b) are higher than that of F1seed control (M_0F_0). This result is in line with previous research results (Nastiti, 2017) on parental plant seeds where the germination rate and percentage of tomato germination from seeds induced by 0.2 mT MF tends to increase despite being infected by *Fox*.Nastiti (2016) result study supports the results of research from Aladjajian (2002) which explains that MFcan increase the formation of energy that is important in the germination process. According to Samani et al. (2013) MFtreatment causes an increase in activity of germinating enzymes such as α-amylase, dehydrogenase, and protease. The increased activity of the germination enzymes will accelerate the

process of hydrolysis of food reserves in the seeds so that it becomes easier to use in the process of glycolysis and other related reactions in the formation of energy necessary for germination. The faster the formation of energy takes place in the seed the faster the germination occurs.The results of this study prove that the parental tomato seeds induced by 0.2 mT magnetic field (MF) are able to produce F1 seeds which also have a germination rate and percentage higher than the germination rate and percentage of control seeds from the parent plant unexposed by 0.2 mT MF(M_0F_0) although the parental seed was infected with *Fusarium oxysporum* (*Fox*) (M_7F_{60}, $M_{11}F_{60}$, $M_{15}F_{60}$). The induction of a 0.2 mT MFfor 7 min. 48 sec. (M_7F_0) to parental seeds produces a type of F1 tomato seeds that result in both the highest average of germination rate and percentage (Figures 1a and 1b). *Fox* infection of the parental seed (M_7F_{60}) decreases the rate and percentage of germination, but the rate and percentage of germination remain higher than the control.This data as well as previous research data (Listiani, 2016) proves that 0.2 mT MFexposure for 7 min. 48 sec. is the optimum exposure time to improve the metabolism process in tomato seeds resulting in either increased vigor of seeds and its ability to keep growing and surviving *Fox* infection. Furthermore, the nature of the parent tomato seeds due to the induction of 0.2 mT MFand *Fox* infection is also seen in the nature of the F1 tomato seeds produced. Listiani (2016) reported that 0.2 mT MFexposure to tomato seeds for 7 min. 48 sec. to parental tomato seeds yielded fruits that have highest fresh weight and dry weight of F1 tomato seeds. According to Lesilolo (2012), the increase in seed weight can improve the seed viability and vigor because the weight of the seeds is related to food reserve contained in the seeds which is the source of energy for seed to germinate.Figure 2 below shows that the treatment of *Fusarium oxysporum* f.sp *lycopersicum* (*Fol*) infection on F1 tomato seeds significantly increases the average germination rate. The average germination rate of infected F1 seeds is 4.80 which is higher than F1 seeds not infected by *Fol* (control) is 3.73.

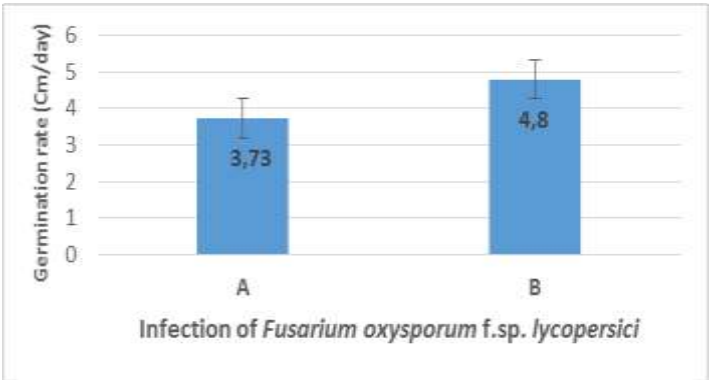

Figure 2. The effect of infection of *Fusarium oxysporum* f.sp *lycopersicum*(Fol) Ongermination rate of induced F1 tomato seeds by 0,2 mT magnetic Field (MF) exposure and *Fusariumoxysporum* (*Fox*)infection

Fusarium sp. is an important pathogen in horticultural crops (Pratiwi et al., 2016). At the beginning of seed growth, the presence of the fungus is thought to also help speed up germination. The growth of the fungal hyphae on the surface of the seed accelerates the softening process of the seed coat (Suharti et al., 2009) so that water is easier to get into the grain tissue and consequently germination takes place more quickly. In addition, softening the seed coat also makes it easy for radicles to penetrate and appear on the surface of the seed coat. Nastiti (2017) proves that Fox infection in parental tomato seeds leads to an increase in germination percentages.According to Suharti et al. (2009) fungus attached to the seed coat is able to degrade cellulose which is the major element of cell walls in the seed coat so that the seed coat becomes more easily passed by the incoming water absorbed into the seed tissue. This statement is supported by Naiola and Nurhidayat (2009) who also reported that Fusarium sp. isolates produced high lignocellulosic enzyme activity. The lignocellulosic enzyme plays a role in the lignin degradation process in the seed endocarps. Thus, the results of this study leadto a suggestion that Fol infection in F1 tomato seeds initially can actually help to improve the germination process, but over time, growth and development of Fol cause obstruction to tomato plant growth and development due to accumulated growth of fungal hyphae in xylem tissue inhibits the flow of water and nutrients (Semangun, 2004).

B. Dry weight of plant

The dry weight of the plant was observed from week-3 to week-6 after germination. The response of dry weight significantly different to the type of F1 seed was seen in the observation result onweek-4 after germination.

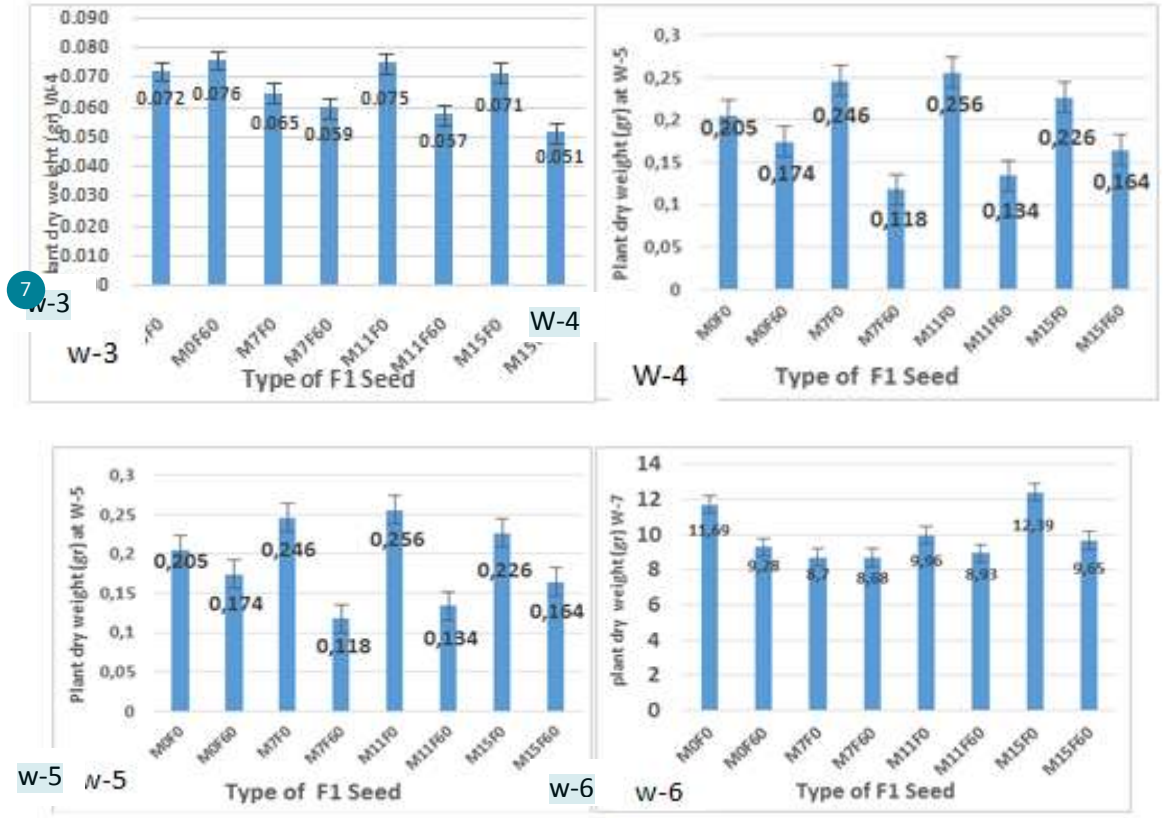

Figure 3. The dry weight of tomato plant observed in week-3 (W-3), week-3(W-3), week-3 (W-3), week-3 (W-3) after germination.

In Fig 3 can be observed that at week-3, the induced F1 tomato seeds by 0.2 mT magnetic field (MF) ($M_{11}F_0$, $M15F_0$) but not infected by *Fusarium oxysporum* (*Fox*) resulted in a dry weight of plants tended to be higher than the control (M_0F_0) although not significantly different. At week-4 the exposure of a 0.2 mT MFto the *Fox*-uninfected parental tomato seed significantly resulted in F1 tomato plant (M_7F_0, $M_{11}F_0$, $M_{15}F_0$) with a higher dry weight than the induced tomato F1plant by 0.2 mT MF and *Fox* infection (M_7F_{60}, $M_{11}F_{60}$, $M_{15}F_{60}$) although not significantly different from the controls (Figure 3b). This result is again in line with previous results (Nastiti, 2017) which showed that tomato plant whose seeds were induced by 0.2 mT MF and not infected by*Fox* resulted in higher plant dry weight than the dry weight of plants grown from 0,2 mT MF-induced tomato seeds and infected by *Fox*.The vigor test results on F1 tomato plant showed that the type of F1 seeds induced by 0.2 mT MF and not infected with *Fox*(M_7F_0, $M_{11}F_0$, $M_{15}F_0$) has a higher germination rate. According to Setyowati and Fadli (2015) seeds with high vigor in addition to germinate faster will also grow and develop better and show resistance to disease attacks that eventually can produce a higher accumulation of photosynthate. In contrast, the germination rate of F1 seeds induced by 0.2 mT magnetic field(MF) and *Fusarium oxysporum* (*Fox*) infection (M_7F_{60}, $M_{11}F_{60}$, $M_{15}F_{60}$) showed a relatively lower dry weight (Figure 3b). This results showed that the parental tomato seeds induced by 0.2 mT MF produced F1 seeds with better vigor to germinate faster, grow better, and produce higher dry weight of the plant.At week-5, there was an average decrease of dry weight of F1 tomato plants grown from M_7F_0, $M_{11}F_0$, $M_{15}F_0$ although not significantly different from other treatments. At week-5 after germination, tomato plants have entered a generative phase that characterized by the appearance of flowers. When entering the generative phase, plantsbegan to occur shift metabolism where most of the metabolite will be used to form reproductive organs so that the accumulation of photosynthate in the vegetative organs of plants to be reduced (Astuti and Darmanti, 2010). These results are supported by reports of Listiani (2016) and Nastiti (2017) which states that magnetically induced tomato plants more quickly enter the generative phase and experience a decrease in dry weight of plants.The average dry weight of F1 plants from all treatments at week-6 did not differ significantly. In the week-6 after germination the tomato plants have began to form the fruit buds so that the energy used by plants to form the reproductive organs more and more. The accumulation of photosynthate is transferred more to the formation of fruit as well as for the continuous flowering (Astuti and Darmanti, 2010).

IV. Conclusion

From the results of the above discussion, it can beseen that the nature of parental tomato seeds induced by exposure to 0.2 mT MF and *Fox* is derived to the F1 tomato seeds. This is indicated by the rate and percentage of F1 seed germination, and the dry weight of F1 tomato plants at week-4 which show the similarity with germination rate, the percentage of germination, and growth of the parent tomato seed. The duration of the 0.2 mT magnetic field exposure to the tomato seed resulting in the highest improved vigor and growth of F1 tomato seedswas for 7 min 48 sec.

References

[1] Agustrina, R., E. Nurcahyani, E. Pramono, I. Listiana, and E. Nastiti. 2016. The influence of magnetic field on the growth of tomato (Lycopersicum esculentum)infected with Fusarium oxysporum. INSIST. 1: 30-33.

[2] Agustrina, R., Tundjung T. Handayani, and Sumardi. 2013. Observation of the effect of static magneticfield 0.1 mt on α-amylase activity in legume germination. Proceeding 2nd. International Conference on Engineering and Technology Development (ICETD),p. 405-412

[3] Aladjajian, A. 2002. Study of the influence of magnetic field on some biological characteristic of Zea mays. Journal of Central Europian Agriculture. 3:90-94

[4] Astuti, T dan S. Darmanti. 2010. Produksi bunga rosella (Hibiscus sabdariffaL.) yang diperlakukan dengan naungan dan volume penyiraman air yang berbeda.Buletin Anatomi dan Fisiologi, 18(2): 47-55

[5] Bawa, 1. 2016. Management strategies of Fusarium wiltDisease of tomato incited by Fusarium oxysporum f. sp. lycopersici (Sacc.): A Review. International Journal of Advanced Academic Research, 2(5): 32-4

[6] De Souza,A., D. García, L. Sueiro, L. Licea and E. Porras. 2005. Pre-sowing magnetic treatment of tomato seeds:effects on the growth and yield of plants cultivated late in the season. Spanish Journal of Agricultural Research, 3(1): 113-122

[7] Hussien, Abdulhakeem D., Gazi M. Aziz, Khalid F. Al-Rawi, Suzy M. Salama, and Mahmoud A. Abdullah. 2015. Effect of magnetic field on peroxidase activity and growth of Panicummiliaceum L. seeds. Journal. of University of Anbar for pure science, 9(2): 36-42

[8] Jedlicka, J., Oleg, P., Stefan, A. 2015. Research of effect of low frequency magnetic field on germination, growth and fruiting of field tomatoes. Acta Horticulturae et Regiotecture 1. pp. 1-4

[9] Lesilolo, K.M. 2012. Studi pemupukan fosfat terhadap viabilitas dan vigor benih jagung (Zea mays L.) varietas hulaliu. Agrologi, 1(2): 119-125

[10] Listiana, I. 2016. Pengaruh Medan Magnet 0,2 mt Terhadap Pertumbuhan Generatif Tanaman Tomat (Lycopersicum esculentum Mill) Yang Diinfeksi Fusarium oxysporum. Thesis. Program Pascasarjana Magister Biologi. FMIPA Universitas Lampung. Lampung.

[11] Morejon, L.P., Palacio, JC Castro., Abad, Velazquez, Govea, AP. 2007. Stimulation of Pinus tropicalis M. seeds by magnetically treated water. International Journal Agrophysics. 21:173-177

[12] Naiola dan N Nurhidayat. 2009. Biologi biji gewang(Corypha utan Lamasrck): keragaman kandungan embrio, kimia dan peranan mikroba dalam proses perkecambahan biji.Berita Biologi, 14(3): 773-78

[13] Nastiti, Eko. 2017. Efektivitas Medan Magnet 0.2 mT Terhadap Vigor dan Karakter Tanaman Tomat (Lycopersicum esculentum Mill.) yang Diinfeksi Fusarium sp. Thesis. Program Pascasarjana Magister Biologi. FMIPA Universitas Lampung. Lampung.

[14] Pratiwi, W.N., Erwina J., dan Lutfi, K.N. 2016. Identifikasijamur penyebab penyakit pascapanen pada beberapa komoditas bahan pangan. Jurnal Riau Biologis, 1(14):86-94

[15] Radhakrishnan, R.and Kumari, B.D.R.2013. Influence of pulsed magnetic field in soybean (Glycine max L.) seed germination, seedling growth and soil microbial population.Indian Journal of Biochemistry and Biophysics. 50: 312-317

[16] Samani, A.M., Latifeh, P., Nafiseh, A. 2013. Magnetic field effects on seed germination and activities of some enzymes in cumin.Life Science Journal. 10 (1): 323-328

[17] Semangun. 2004. Penyakit-penyakit Tanaman Hortikultura di Indonesia. Gadjah Mada University Press, Yogyakarta.

[18] Setyowato, N. dan A. Fadli. 2015. Penentuan tingkat kematangan buah salam(Syzgium polyanthum (wight) walpers) sebagai benih dengan uji kecambah dan vigor biji. Widyariset. 1(1): 31-40

[19] Suharti, T.,N. Yuniarti, E.Rustan, E.R., Kartiana, A.R., Hidayat, dan E. Ismiati. 2009. Pengaruh Hama dan Penyakit Benih Selama Pengolahan dan Penyimpanan terhadap Viabilitas Benih dan Vigor Bibit di Persemaian (Laporan Hasil Penelitian). Balai Penelitian dan Pengembangan Teknologi Perbenihan. Bogor.

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