FOOD COLOURINGS AS FILMING MATERIAL ON OIL PALM SEEDS AND GERMINATED SEEDS

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ABSTRACT

During the last 5 decades, oil palm area in Indonesia has shown rapid growth, which indicates that oil palm plant material is still in high demand. However, increasing number of licensed germinated oil palm seed producers in Indonesia, as well as possibility of seed import from surrounding countries, forcing every oil palm seed producer in Indonesia to be more competitive. Diversification of germinated oil palm seeds by adding colorings on the surface of the plant materials is expected to be able to attract consumers. Nonetheless, seed germination as well as seedling growth must not be effected due to the application. The research applied film coating on oil palm seed and germinated seed surfaces by utilizing common food colorings. As the results, it was shown that the film coating did not effect on seed germination as well as on germinated seed development onto seedlings. Moreover, the application on germinated oil palm seeds showed that the applied food colorings were absorbed more on the radicle of the germinated seeds, allowing consumers to be able to distinguish between plumule and radicle in ease. It is believed that culling due to upturned planting during pre-nursery stage, will be reduced caused by this occurrence. It was also shown that growth and development of the applied germinated seeds onto seedlings, were not inhibited by the filming application. It is concluded that filming application by utilizing food colorings on the surface of germinated oil palm seeds is potential to be applied as product diversification.

Keywords: coating, filming, film coating, germinated seeds, oil palm, seed

INTRODUCTION

Oil palm (*Elaeis guineensis* (L.) Jacq), plant species which produces the highest oil per hectare area compared to other oil producing plants (Wahid *et al*., 2011), shows tremendous acreage growth in Indonesia. Data, which was presented by Lubis (2008) and Amalia *et al*. (2012), shows that in 1967 there were only 105,000 hectare of oil palm plantations in the country. However, approximately five decades after, in 2015, Direktorat Jenderal Perkebunan Kementrian Republik Indonesia (2014) estimated that the number rocketed 109 times, to 11.44 million ha.

Increasing acreage of oil palm plantation in Indonesia is believed highly related to increase on world population which requires palm oil as one of basic needs, in addition to capability of the oil to be modified onto several products. Darmosarkoro (2013) stated that approximately 75% of palm oil, which was produced in Indonesia, was utilized for frying oil, margarine, and shortening. While rest of the product was converted onto oleo-chemical products and natural

oil based fuel (biodiesel). Moreover, the writer declared that oil palm has become tree of life due to its broad roles to the human life.

It is believed that the higher the demand on palm oil products, the higher the need on plant material of the species. Darmosarkoro (2013) noted that out of 230 million germinated seeds produced by 10 certified producers in Indonesia, most of them were absorbed by domestic market. Nevertheless, marketing data on germinated seed sales in 2013 and 2014 at the 10 producers, showed decline feature compared to the data in previous years (Purba, 2014). The occurrence may have effects on income, especially for those where plant materials provide substantial portion on income of the company (Darmosarkoro, 2013).

It is believed that the decreasing pattern of germinated seed sales was not indicating that demand on oil palm plant materials was low. By using interview method to smallholders, Purba *et al*. (2014) concluded that approximately 22% of smallholders in Aceh province, 28% in Bengkulu province, and 63% of smallholders in West Sumatera utilized illegitimate germinated seeds as their planting materials. Furthermore, even with decline pattern, the 10 legitimate seed producers were still able to market their germinated seeds (Purba, 2014), indicating that market of oil palm planting materials was still widely open, even with competition between seed producers as well as between legitimate seed producers to the illegitimate ones. Halmer (2000) stated that filming application by using colorings may attract consumers and can be a tool to distinguish different seed groups, there are possibilities that filming application on oil palm seeds may affect germination percentage, and alter markings that have been given on seed surface. While filming application on germinated oil palm seeds may lessen affect seedling growth and development.

By utilizing food colorings as filming material, this research was aimed to evaluate effects of film coating on germination rate of oil palm seeds, as well as seedling growth and development of treated germinated oil palm seeds.

MATERIALS AND METHODS

The research utilized filming method as described by Halmer (2000). Oil palm seeds and germinated seeds, as research materials, were film coated by soaking the materials in 2% (v/v) solution of food colorings for 10 minutes. After the soaking process, the materials were air-dried for 5 - 8 hours for seeds or 5 - 10 minutes for germinated seeds.

Film coating treatment on seeds was done on 3 seed crossings which dormancy had been broken. Each crossings was divided into 2, one seed set as treated while the other as control with no filming treatment. All the experimental units were then placed in seed germination room with room temperature as described on working instruction of Seed Production Division of Indonesian Oil Palm Research Institute (IOPRI) (PPKS, 2007). First selection was conducted 2 - 3 weeks after the seeds were placed in the germination room, while next selection process was done 3 to 4 days after the previous selection. The selection was done up until 12 selection processes.

Film coating treatment on germinated seeds was conducted by soaking germinated seeds, which derived from 1 variety, with 3 different colorings (red, yellow, and pink) while another set was prepared as control with no film coating treatment. The utilized colorings were food colorings with 2 % (v/v) concentration and 10 minutes of soaking process. After the soaking treatment, the germinated seeds were then air-dried for another 10 minutes and planted in

pre nursery polyethylene bags as described on standard operational procedure of nursery at IOPRI (Lubis, 2008; Sulistyo *et al*., 2010). After being planted, monthly observation was done on 3 vegetative characters of oil palm seedlings, i.e. seedling height, trunk diameter, and generated frond number.

RESULTS AND DISCUSSION

Film Coating on Germinated Seeds

On treated germinated oil palm seeds, it was demonstrated that the colors applied on the seed surface show different strength. The happening is believed due to oil palm shell is dominated by black, so that only certain parts of the seeds affected by the application. However, colorings was exposed strongly on radicle part of the germinated seeds than that on plumule part (Figure 1). The happening can be an advantage since by that, consumers can differentiate plumule and radicle in ease so that number of future rejected seedlings caused by upturned planting – an occurrence where planters fail to differentiate plumule and radicle, and plant the germinated seeds in upside down way where plumule is facing down while radicle is facing up – can be diminished.

Figure 1. Color strengths on germinated seed surface are different depend on color which is applied. However, color is well exposed on radicle so that consumers can be easily differentiate between plumule and radicle. Left to right: Pink, yellow, red

In addition, film coating with applied colors (red, yellow, and pink) did not cover the 'PPKS' marking, which have been applied on the seed surface as legal marking of the company. By that reason, the filming application is believed will not interfere the current germinated seed production process.

Figure 2. Color strengths on seed surface are different depend on color which is applied. However, the applied colors can endure even after spraying application to maintain seed water level. Left to right: red, pink, yellow

After the process, filmed germinated seeds gathered with control germinated seeds, were than planted in pre-nursery polybags and three vegetative characters of seedlings, i.e. seedling height, trunk diameter, and generated frond number, were observed. Data analysis result on the three characters (Table 1) indicates that film coating application did not inhibit seedling growth. Moreover, seedlings which were derived from yellow color film coated seeds showed higher numbers of trunk diameter and frond number which were significantly different to those on control and on other applied colors. It is believed that the happenings were caused by different ingredient composition where red and pink dyes contain thickener, i.e. propylene glycol, and basic ingredient color, while the yellow dye also contain glucose as one of its ingredients. Nonetheless, further research is required to assure that the glucose content caused the occurrence.

Table 1. Coloring effects on three vegetative characters of 3 month seedlings

Treatment	Plant height (cm)	Frond number	Trunk diameter (cm)
Control	16.79 a	3.88 ab	5.10 a
Dye 1	17.14 a	4.01 b	5.59 bc
Dye 2	16.72 a	4.15 c	5.71 c
Dye 3	16.82 a	3.85 a	5.34 ab

Values followed with same letter on the same column indicating that the numbers are not significantly different based on DMRT 5 %

Film Coating on Seeds

Result of the activity showed that as it was conducted on germinated seeds, film coating on seeds provides different color strength depends on the applied color. In addition, after several days of application, the applied colors did not fade out, even with spraying application, which was conducted three days after the seeds are placed in the germination room for the water content to be increased.

Table 2. Descriptive data of germination percentage on seed filming by using colorings

Treatment	Mean	Std. Deviation
Control	63.52	22.66
Filming	74.39	5.69
Total	68.96	15.93

At the end, germinated seeds were selected up to 64 days after the seeds were placed in the germination room. Data analysis indicated that film coating by using colorings on seeds, which dormancy had been broken, did not affect on germination percentage, even with high mean (74.4%) compared to that on control (63.5%) with p=0.46 (Table 2).

CONCLUSION

Color strength showed on filmed seed and germinated seed surfaces, depends on the color applied. Besides coloring the shell, film coating application also colors radicle and plumule of the germinated seeds, which occurrence is believed ease consumers to differentiate between the two ornaments. In addition, the research displayed that film coating by using the colorings did not affect germination percentage of the treated seeds, neither to seedling growth and development when the method is applied on germinated seeds. It is suggested for further research to be done to acknowledge ingredients of the film coating which affect most to growth and development of the formed seedlings.

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