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Effects of Neodymium Magnets on Kale Soil Germination (Ipomea Reptans Poir)

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Abstract –Static neodymium Garde N52 magnets (0.63mT) were exposed to ground kale seeds (Ipomoea Reptana Poir), with the storage period ending. Water spinach seeds are planted in soil media mixed with sand and clay compost in a ratio of 1: 1: 1 in a plastic pot. Before planting kale seeds soaked in water to choose seeds that can still be germinated. Neodymium magnets are magnets included in light rare earths, choosing these magnets to determine the effect of the percentage of ground water spinach seed germination, by adjusting the location in the planting pot, that is, above the soil media, in the soil. Media and without magnetic control. Water spinach seeds were planted as many as 25 grains, soil pH, soil moisture and soil temperature were measured every two days to determine the quality of acids and bases in soil media. Water spinach seeds were observed on day 4 with a stem appearance of around 2 mm considered to have germinated. Water spinach seeds that were given a magnet in the soil at the end of measurement on the 14th day grew 72% compared to controls, while those given a magnet in the ground were about 89% of the controls. The effect of the location of the Neodymium magnetic field on ground kale seeds is a positive optimal value for the percentage of completion. Total chlorophyll in kale leaf was tested on the 14th day with kale leaf spectrophotometer with the highest magnetism in the soil around 23mg / L, for control and magnetism in the soil was almost the same, namely 16.8mg / L and 16.76 mg / L.

Key Words: Neodymium Static Magnets, Rare Soil, Soil Kale Seed, Percentage of Germination, Soil Kale Leaf Chlorophyll

1. INTRODUCTION

Kale crop land (Ipomoea Reptana Poir) found many paddy fields or in the fields. In addition it can also be kale plant crisis in that culture at home in a polybag or pot. Kale crop land and has a green colored stems and leaves are tapered. Indonesian society utilizing kale plants to be processed into food (Ning et al., 2016). In addition kale plants can be used as a herbal medicine, such as insomnia, ulcers and headaches. Media planting kale enough land in the form of soil nutrients, minerals and rich in organic matter. Fertilizer in kale plants together with the necessary food by humans. However, with the longer the time which makes the possibility of contaminated soil nutrients lower the quality. When the nutrient conditions deteriorating for the environment then the absorption of nutrients in the lower water spinach plant, and allow imperfection to grow (Salama & Iarwati, 2013)

Rare earth metals (JPL) is a mineral element that is able to react with other elements to create something new. Dikembang rare earth metals to help perkebangan environmentally friendly technologies. By performing the processing of monazite rocks can be used as a phosphate fertilizer. Fertilizers from waste processing rare earths can be used as an alternative for agriculture (Carpenter et al., 2015). Elements of the rare earth minerals along with calcium can be absorbed by the growing plant roots. Physiological metabolism of plants can absorb elements of the rare earth metals can replace the calcium in collaboration with proteins and enzymes so that the plants can photosynthesize and wastage occurs elements not required by the plant (Kordas, 2002).

Neodymium magnet element as one element of monazite rare earth metals is still largely unknown in the germination of seeds. Therefore, the objective of this research was conducted to study the physiology of plants grown in soil treated with neodymium magnets. Media komposis land used given the same comparison, namely, clay, sand compost fertilizer with a ratio of 1: 1: 1. The effect of the treatment is given for neodymium magnets used spinach seed is expired condition. So with perlkuan neodymium magnets can help the simultaneity of germination, to set at room temperature, kelembabaan, and soil pH were measured every two days.

Measured from seed germination test kale that grows on the 4th day and how much seed dormancy at day -10 and seeds were dead at day -14. Leaf chlorophyll content was tested with a spectrophotometer to determine the tiers of photosynthesis from the leaves, because logama rare earth affect the absorption of nutrients and photosynthesis process of plants.

Several studies on the effect of the rare earth metals, calcium activity, cytoplasmic membrane structure and the process of photosynthesis in plants can be positive in the improvement of agricultural crops (Fu, 2012). Neodymium rare earth elements used in an application that is placed in the soil growing medium for the grain crops have increased the grain growth of 14.0% compared with the control, the content of phosphorus and potassium roots of

peas also increased better than the control without neodymium magnets. Static magnetic induction treatment is also influenced by the treatment given plant species. Things to do to see the effects of static magnetic treatment can save the water quantity particularly drought-prone areas (Majd & Shabrangi, 2009). Neodymium magnets arranged direction to the north and south poles of coriander seeds were germinated experiencing a positive influence to the growth direction of stems or more higher than the ceramic magnets (Rosales et al., 2018).

2. MATERIAL & METHODS

This research was conducted at the Laboratory of Telecommunications Engineering Polytechnic of Malang Indonesia. Neodymium magnets (NdFeB) were tested using a magnetic field PHYWE Teslameter with 20-2000mT measurement range. Magnet Neodymium magnets included in the N52 Garde (0.63mT). Land kale seeds (Ipomoea Reptana Poir) as much as 25 seeds in a pot experiment. Seed kale land included in the form of negative mass selection means damaged seeds are fewer in number than the good seed to be planted. For negative mass selection using the system dormancy breaking by immersion. Kale seeds land expired in August 2018. For Germination use a plastic pot with a diameter of 15 cm and 10 cm pots. Distilled water for soaking seeds of kale for 2 hours to occur imbibisi and selecting seeds that they can be given a static magnetic treatment. Kale seeds that float sorted and left are still submerged in distilled water. Neodymium magnets with a size of 20x10x1.5 mm. Neodymium magnets including permanent magnets of the type of rare earth magnets, made of an alloy of neodymium, a fluoro-carbonateserium with a composition of 60% -70%.

RESEARCH METHODS

This research is an experimental study, determination of trial samples taken at random from land kale seed germination parameters and Neodymium magnetic field effect on the growth of crop seeds. Seed sample used as many as 75 divided by 3 pots seed treatment. Pot I was given as treatment with Neodymium magnets placed above the surface of the planting medium, treatment of II with Neodymium magnets inside put the planting medium with a distance of 2 cm from the ground, treatment III is a magnet treatment given control without the growing media. The intensity of the applied magnetic 0.63 mT. Germination testing begins on the 3rd day observed with observations from kale seed germinating and the amount calculated in percent. Germination percentage is the proportion of the number of seeds in the germination in accordance with the time periods specified in the treatment group. The percentage of normal seedling by reviewing the structure of direct observation. The methods developed by the laboratory scale control environmental conditions. Observations of soil temperature, soil moisture and soil pH were measured every two days for the control of seed germination conditions. Control of environmental factors in order to obtain an optimal germination of seed lots. The calculation of the number of leaves growing, and chlorophyll levels in the group of germinated seeds are also used as parameters of quality seed dormancy kale expired. Seed kale includes plants that need moisture cropping media then watering is done every two days so that the seeds do not experience water shortages. Figure 1 shows the design of the effect of neodymium magnets on land kale seed dormancy.

Figure 1. Magnetic Field Design To Seed Kale

Selection of spinach seeds from the soaking for two hours are used to determine the seeds that still have to be able to grow embryos germinate. Expiry seeds allows the seed into dormancy. Test germination, as well as the observations of the number of seeds to grow 3 different treatments. Neodymium magnet layout as the observation of a growing percentage of seed germination and emergence of leaves growing. The total chlorophyll tested after age kale leaves grow on the 14th day. Chlorophyll test is used to determine the effect of magnetic fields on the quality of the chlorophyll in the leaves of kale. Total chlorophyll was tested using a UV-Vis spectrophotometer premises n wavelengths 649 nm and 665 nm. Type Shimadzu UV-Vis spectrometer 1800.

Leaf samples were taken from the child leaves the tip position, kale leaf stems bright color conditions are taken from all the plants with 3 treatments. Weight of leaf samples weighed as much as 100 mg. Scanning spectrophotometer wavelength of between 400-700nm. Equation 1 shows the formula for calculating the total of kale plant chlorophyll in accordance with the formula of Wintermans and DE Mots,

The total chlorophyll (mg / L) = 20 (OD649) + 6.1 (OD 665) .. (1)

Description: OD (optical density) or absorbance values of chlorophyll.

Germination percentage is calculated by the equation 2,

$$\text{DB}(\%) = \frac{\text{KNI} + \text{KNII}}{\text{TotalBenihyangditanam}} x\,100 \quad \ldots\ldots\ldots\ldots (2)$$

Description: KNI = Number of normal seedling on

1st observation.

KNII = Number of normal seedling on

2nd observation

RESULTS AND DISCUSSION

Data-shaped germination percentage of germination was taken quantitatively, measurements carried out on the 3rd day. Until the day to -14, the data is determined from a comparison of germination of the average value of the seed growing seed dormancy as in Figure 2.

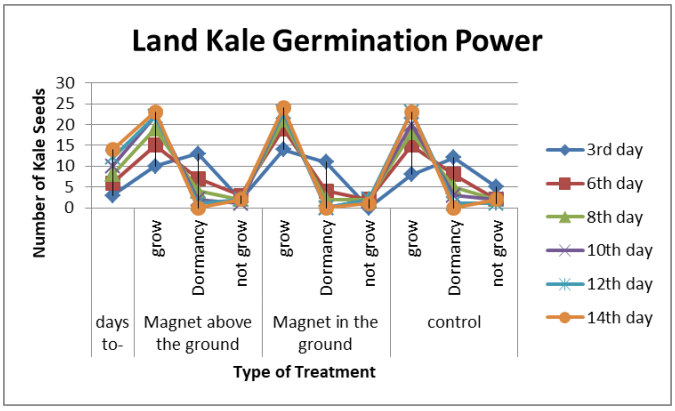

Figure 2. Comparison of Germination Power

Analysis of Figure 2 treatment on the seed kale expiration condition can be measured by providing a magnet neodymium magnet inside the seed with soil media experience germination of almost 89% compared to controls. The average amount given the occurrence of seed dormancy with neodymium magnet treatment decreased so that the fully grown, about 0.2%. Observations germination done until day 14. Total leaf chlorophyll was observed on the 10th day so that the highest value is known chlorophyll content in leaves of kale in a spectrophotometer test as shown in Figure 3.

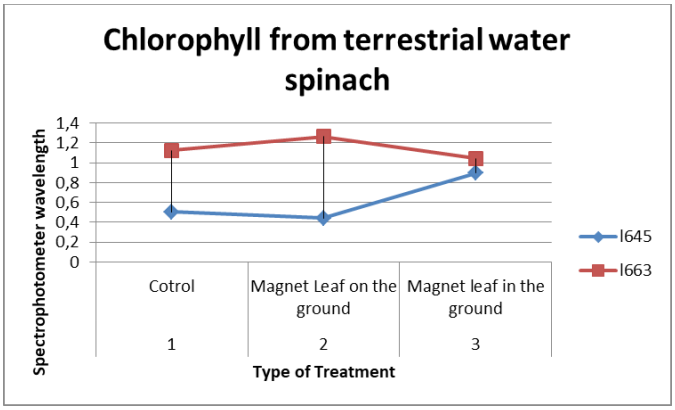

Figure 3. Number of Kale Leaf Chlorophyll Army

Based on the results of testing for the kale leaf chlorophyll values are the highest value in the treatment of neodymium magnets in the ground. Total chlorophyll in magnet placed in the ground around 36.15 mg / L. Calculation according to equation (1). Figure 4 kale leaves landline number during treatment neodymium magnetic fields also include the development of three different treatments. The number of leaves taken from healthy leaves growing on average until the 14th day.

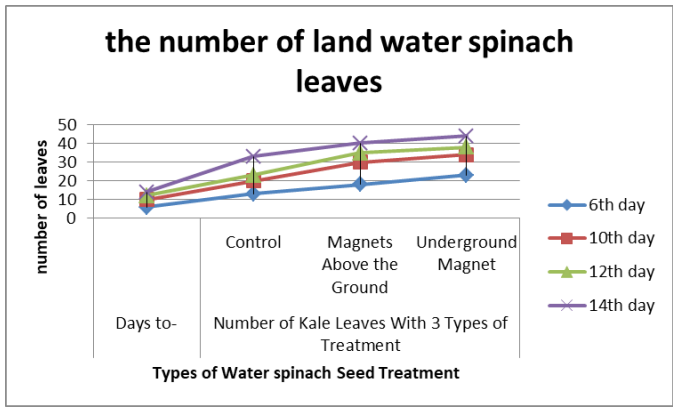

Figure 4. Number of Kale Leaf Land With Magnets

3. Conclusion

Based on this research can be concluded that the location of the magnet neodymum affect the germination rate of land kadalurasa bijikangkung, magnetic induction kale seeds can suppress the level of dormancy in swamp land to 0.2%. Germination of the magnet to the location above the media and in media land almost close to the same, namely 72% and 89%. The layout of magnets affect the germination percentage of the seeds into a small dead kale around 0.1%. Observation until day 14 neodymium magnets are positive on the germination of seeds of kale expired. Suggestions of research that has been carried out the necessary assessment of more types of magnets with different sizes and shapes that can be used to look at the impact on other types of plant seeds,

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