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APPLICATION METHODS FOR CONVENTIONAL AND MODERN DEVELOPMENT OF ONION (*ALLIUM CEPA* L.) IN ABIOTIC STRESSES

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Abstract

Onion is one of the featured vegetable crops that can not be substituted to function and contribute considerably against the economic development of the region. These commodities include annuals but the need for onion every year has increased. Thus, done the researchaim to obtain crops of onion (Allium cepa L.) high producing through conventional techniques, and obtain clones of onion (Allium cepa L.) that is capable of producing and productivity both on salinity and drought condition through plant tissue culture (modern). This research was conducted at the Experimental Garden and Plant Tissue Culture Laboratory of the Faculty of Agriculture, Cokroaminoto Palopo University. Each of these methods using three-factor factorial design in a randomized block design. Development of onion on abiotic stresses done using conventional methods and modern. One of the increase in crop production is done through the implementation of cultivation techniques is the use of organic fertilizers can be derived from the dregs of sago and palm bunches that can improve the physical and biological properties of the soil. While through tissue culture techniques can improve the genetic diversity through somaclonal variant induction. Somaclonal variation proved able to acquire the plant variants with specific characteristics. Through this modern technique can be selected using selective media is NaCl and PEG 6000 to identify variants somaklonal tolerant to salinity and drought and to develop cultivars tolerant of abiotic stress conditions.
Keywords : *abiotic,plant tissue culture, NaCl, PEG 6000, salinity, cultivation techniques*

Introduction

One species of Allium are grown in Indonesia is Allium Cepa agregatum group called onion (Boediono 2004). Onions (Allium cepa L.) is a vegetable crops of high economic value, together with other food commodities, because they contain high nutritional thus becoming one food needs. These commodities included in the herb group was not bersubtitusi and tuber contains essential oils that are used as a food flavoring, bactericide, fungicide, and efficacious as traditional medicine (Rahayu and Diamond, 2008). Generally, these commodities include commodity that has long been intensively cultivated by farmers who became a source of income and employment and has contributed considerably against the economic development of the region (Agricultural Research and Development, 2005).

Production and productivity onion in indonesia 2011 to 2015 increased that is each 893,124 tons and 9.54 ton/ha, 964,221 tons and 9,69 ton/ha, 1,010,773 tons and 10,22 ton/ha , 1,234,984 tons and 10,22 ton/ha, and 1,234,723 tons and 10,16 ton/ha. But, production and productivity onion in south sulawesi 2011 to 2015 fluctuating namely 41.710 tons and 9 ton/ha, 41.238 tons and 9,13 ton/ha, 44.034 tons and 9,64 ton/ha, 51.728 tons and 9,91 ton/ha, and 70.292 tons and 10,05 ton/ha. This is caused by land conditions inadequate, system cultivation which are not based on, and have not the availability of varieties of onion, capable of adapting on condition cekaman abiotik for example salinitas and dryness.

The main obstacle increased production of onion in indonesia generally and in south sulawesi especially caused by the conversion arable land for the benefit of non agricultural annually increased, for example housing, industry, business, and infrastructure. A consequence was a necessity land for farming can only be met through

the use of land suboptimal that is generally poor hara, and often hit by drought (Azrai, 2013). Of land use suboptimal incapable of supporting plant growth in an optimum manner (Balittanah, 2016).The shortage of agricultural land will result in the drop in production even in the long term will result in the food crisis. The speed of land over the function of reach for 80,000 ha. Bobjen (2014) has suggested reached 100-110 thousand ha per year, so that if the average 4.6 tons of production, then the potential loss of the result reached 506,000 tons per year.In addition, global climate change (climate change) is also one of the threat to the continuation of the production of a crop.Climate change would have an impact on the increase of temperature (global warming) are followed by flooding and dry season extreme. Other changes will have an influence to cultivation activities agricultural is shifting the distribution of rain increasingly difficult to predicted, so that of determining the time planting difficult and risks of crop failure the bigger (balitbang agricultural 2011, Adger et al., 2005).

Obstacles development onion fore as he was a challenge for researchers in producing technological innovations either spatially traditional and modern to produce varieties a superior capable of adapting to climate change. Conventional technology cultivation of system for example fertilizing use fertilizer organic.Assembly varieties a superior capable of adapting on condition cekaman abiotik as salinitas and dryness can be produced through the application of modern technology that is tissue culture plants.

The provision of organic fertilizers to lower do bulk density land that causes land becomes more light so as to give the conditions are right for the development roots and impact on growth and the production of plant (Subhan et al., 2005). Suliasih et al., (2010), the provision of organic fertilizers can make the land structure better, increase hara available to plants, increase the population and activity microbes land have an impact on the production of a crop. In addition, the provision of fertilizer compost pressing keel weight in tubers onion after dried or kept.Muku (2002), the provision of amounts of cow manure 15 ton/ha to lower do bulk density of 1,13 g cm^{-3}be 1,08 g cm^{-3}.

Widiawati et al., (2002), the provision of organic fertilizers on the ground capable of repairing the structure of the soil, increase absorption capacity water in the ground, and increase growth and the production of plants.Suratmini (2004), the provision of fertilizer 15 tons of ha^{-1} amounts of cow manure to lower do bulk density of 1.00 g cm^{-3} be 0,98 g cm-$^{-3}$, increase the water level of 27,22 % to 29,11 %, and increase space pore of 62,32 % to 63,09%. Suwandi and Rosliani (2004), the use of compost on onion capable of suppressing weight loss after dried onion bulbs / stored. Kamstaityte and Vidmantas (2004), the use of 4.4 μM BAP and 10.6 μM kinetin can improve root growth onion. Rizqiani (2007), a liquid fertilizer 10 L ha-1 is capable of producing fresh weight of 7.58 tonnes of beans that ha-1. Rufaida et al., (2013), media ms by the addition of 0.01 ppm iaa and 1 ppm bap capable of inducing organ onion plants and the addition of 0.5 ppm iaa and 1 ppm bap capable of initialize planlet onion. Plants the regeneration tissue in culture in vitro was likely to have the phenotype who tolerant about the condition of (Yunita, 2009).

The Increase Onion Through The Application Of Conventional Method

One of the increased production of plants can be done through the application of technique the cultivation of plants.A source of organic fertilizers could have come from various biomass or organic matters, as debris or animal. Any organic matter having content and composition element hara different.Organic fertilizers been an pembenah the land most good and natural than material pembenah artificial. In general, organic fertilizer containing macro nutrients N, P, K is low, but it contains micro nutrients in sufficient quantities indispensable growth of plants as ingredients pembenah soil, organic fertilizers prevent erosion, the movement of the ground and cracks in the soil, and retain moisture soil (Sutanto, 2005).

Generally , a source of materials organic is manure and compost estimated from an annual plant (industry) (Efendi, 2010). The provision of organic fertilizers proper can improve the quality of the soil, the water supply optimal, so that facilitate absorption hara of plants as well as stimulates growth roots. The element of disturbances content in organic fertilizer not too high but fertilizer it had yet another feature namely can improve the physical properties of the ground like the permeability ground, the porosity of the ground, soil structure, hold water resources , pH and improve the cation fix the ground as well as the nature of biology land (Yusuf, 2009). The use of organic fertilizers better than chemical it is not meudah tercuci by water and erosion.Organic fertilizers usually used as fertilizer basic given before planting because it slow take off element hara (Isnaini, 2006) .

Damanik et al., (2011) stated fertilizer biological is fertilizer containing material active that capable of producing a compound participate in the process provision of element hara in the ground, so that it can be absorbed plants. Biological fertilizer also helps businesses reduce the environmental pollution caused by the spread of nutrients that are not absorbed by the plants on the use of unorganic fertilizers. Through the application of biological fertilizer, efficiency provision of hara will rise so that the use of fertilizer unorganic can be reduced.

Some studies using organic fertilizers that Widawati et al., (2010) and Suliasih et al., (2010) states that the use of biological fertilizers (inorganic) capable of increasing the microbial population of the provision of biodiversity leads to an increase enzyme activity fosfomonoesterase acids and bases, which further in the supply of nutrients (P available) in the soil. Firmansyah et al., (2015) said that the organic fertilizers and hayati influential of the results of umibi wet, dry eskip is as much as 15.48 ton/ha, and a keel weight tubers red. Tambunan et al., (2011) stated that emberian various media composition cropping had have real impact on the parameters of higher plants, the number of saplings, number of leaves, wet umbiper weights the sample, the weighting of the dried tubers per sample, wet tubers weight per plot, and weights the dried tubers per plot .

Selection Genotype Onion Through The Application Of A Method Of Modern Through Tissue Culture Plant

Technique tissue culture is technique efficient to of copying klonal plants.Technique tissue culture also gives a chance to the establishment of the an individual on his superior through induction variation somaklonal or engineering genetics (Kurniawan and Wahyu, 2016). Tissue culture commonly used for the purpose of making copies of micro en masse and fast.The purpose of making copies of micro this is for producing plants in large quantities by a short time especially for a superior varietas-varietas new produced. The benefit of tissue culture plants which are (1) manipulate number of chromosomes through particular chemicals and meregenerasikan tissue some endosperm, (2) producing plants and dihaploid haploid that homogenus through the culture of the anther or microspores, (3) polinasi in vitro and the growth of an embryo in a normal way experienced abortif , (4) hybridization somatic through fusion the protoplasm of technique, (5) variation somaklonal induction, (6) the transfer of dna or organel to obtain certain properties desired (Wattimena et al., 2011) .

Genetic diversity is the main requirement in various breeding programs, one of which can be enhanced through the induction of somaclonal variants. The presence of genetic diversity in plants the results of tissue culture (variation somaklonal) it enables the plants to get variant with particular characteristics. In vitro selection by using selective media by using nacl and peg is expected to help identify a variant somaklonal that tolerant of salinitas and dryness and to develop cultivars of tolerant on condition cekaman the environment(Badami and Achmad, 2010).

Plant propagation onion in vitro have been made in allium cepa and allium ascalonicum. Generally, plant propagation onion be done in conventional through perbanyakn vegetative use tubers. The seeds from tubers often have weakness namely the pathogenic a virus that originates of the accumulation of pathogenic from the and will unloaded on every generation so that it can be mengakbatkan sent down productivity onion (Budiyono, 2012).

Stage a callus selection and the regeneration of an onion plant in a media basic (Murashige and Skoog, 1962) by the addition of dossier (sitokinin) or that dossier dokombinasikan with naa (auksin). The use of combination auksin and kinetin (a derivative sitokinin) for the regeneration shoots onion had a chance to produce regeneration in vitro onion that directly capable of support the development of the onion.

Some of studies support that Dixit et al., (2013) states that the addition of plant growth regulator cytokinin and in this case the combination of BAP and NAA produce 3-4 buds per callus. Khar et al., (2005) stated that in Allium Cepa shoot regeneration using growth regulators kinetin 2 mg / L showed better results with terinduksinya 5-8 buds on the callus, while for the use of BAP resulted in the growth of shoots albino with chlorophyll deficiency.

Mechanism Adaptation To Stress Saline Plant

Salinity problems continue to increase due to a decrease in the quality and quantity of drainage. According Ghafoor et al (2004), salinity is an abiotic stresses that affect the productivity and quality of crops. Salinity cause plant growth and development. Impaired growth and development of plants in saline conditions caused by (1) a decrease in osmotic potential soil solution thus reducing the availability of water for plants, and (2) an increase in the concentration of ions that are toxic (toxic) for plants or spur imbalance in nutrient metabolism and chemical changes in the physical structure of the soil. The imbalance of ions in laruitan soil can affect nutrient absorption, for example, ion concentration of Cl, Na^+ is high in the soil solution can decrease the absorption of ion K^+, Ca^{+2}, Mg^{+2} (Sopandie, 1990; Sopandie et al., 1990ab, 1995ab ; Marschener 1995). Pemyerapan balance between K^+ and Na^+, or the ratio K/Na became one indication of crop tolerance to salinity (Sopandie et al., 1993; Marschener 1995).

According Marschener (1995), the mechanism of tolerance to salinity is the mechanism of exclusion and inclusion. Exclusion mechanism is a mechanism to prevent water deficit internally by way of synthesis of organic solutes and improve sukulensi. While mechanical inclusion of a mechanism to prevent toksiistas ions through a network that has a high tolerance to increased salt concentrations in a way kompartementasi salt, synthesis of solute compatible, and the exchange of K^+/Na^+, as well as the avoidance of ion berkosntrasi high by way retrantranslokasi salt through the phloem, salt excretion, and shed old leaves. Plants have done ekslusi just save salt in konsentasi very low in stems and rates because of plants capable of meretranslokasikan salt back to the rooting, while plant with mechanism of inclusion of to keep salt in high concentration on the stem and rates. Plants that have a mechanism of exclusion only to store the salt in very low concentrations of the stems and buds because the plants are able to put the salt back to the root zone, while the plant with the inclusion mechanism to store the salt in high concentrations in the stems and shoots. Transport ions play an important role in the adaptation plants to salinitas without regard to mechanism tolerance owned by plant (Marschener, 1995).

Mechanism Adaptation Of Plants To Drought Stress

General mechanisms that plants can adapt to drought stress, the drought escape, avoidance dehydration, dehydration tolerance, and drought recovery (Fukai and Cooper, 1995). Nevertheless, the plants often use more than one mechanism for drought resistant (Mirta, 2001).

Drought escape is the ability of plants to complete their life cycle before the existence of quite serious drought. These mechanisms include the development of fenologi quickly (at flowering and harvest age earlier), developmental plasticity (variation in the growth period of water deficit depend), and remobilisasi asimilat pre-kebiji anthesis (Fukai and Cooper, 1995; Mitra, 2001).

Dehydration avoidance is the ability of the plant to keep the water potential of the network remain high though at conditions less water, with water absorption how to fix it, save it in the cells of plants, and reduces the loss of water. Drought avoidance occurs through maintenance of turgor of cells by increasing the depth of the root, the root system is efficient, as well as increase the rate and amount of water transport into the canopy and to reduce water loss through the epidermal layer (such as stomata and lentikuler), reduces sorption heat radiation through the rolling or folding leaf (leaf roling or folding) and reduces evaporation through the surface of leaves (leaf area). Plants in drought conditions will survive by keeping the cells remain turgordan reduce water loss (Fukai and Cooper, 1995; Mitra, 2001). Fukai and Cooper (1995) explains that most strains of rice that has the ability to grow and thrive relatively well during a drought is to keep the water potential of leaf remained high.

Dehydration tolerance that plant response to low water potential network determines the level of tolerance of plants to drought. This mechanism keeping torgor through osmotic adjustment (osmotic adjustment, the process of induction of solute accumulation in cells), improves the elasticity of the cell, reducing the cell size, and resistance protoplasm (Fukai and Cooper, 1995; Mitra 2001).

Drought recovery is a healing mechanism by which normal metabolic processes again after experiencing the stress of drought. This mechanism occurs in the early development of the plant. Some genotype rice capable of producing some saplings although in drought conditions, the saplings still productive. Recovery from drought stress genotype associated with its ability to maintain the leaf remains green during the dry period (Fukai and Cooper, 1995).

Conclusion

On the basis of the literature journal used it can be concluded that the increased production of onion can be made using organic fertilizers has on the system. Organic fertilizers contain micro nutrient elements for plant growth. Use organic fertilizer is aimed to improve the structure and texture of the soil, prevent erosion, the movement of the ground surface and cracks of the soil, soil moisture and maintain. Development onion in modern could be done through culture techniques plant tissue both tubers. Through tissue culture, can increase genetic diversity in plants the results of tissue culture (variation somaklonal) .

Selection a callus and planlet that produced on the condition cekaman salinitas and dryness can use agent selection nacl and peg 8000 that can identify variation somaklonal who tolerant of salinitas and dryness. Genotype of onion, tolerant of salinitas have done sanction to salinitas the mechanism ekslusi and inclusion. While, genotype of onion, tolerant of drought have done tolerance the drought escape, avoidance dehydration, dehydration tolerance, and drought recovery.

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