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Growth and Yield of *Solanum tuberosum* at Medium Plain with Application of Paclobutrazol and Paranet Shade

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Abstract

This experiment has an object to study the response of four potato cultivars to paclobutrazol and paranet shade application in medium plain. Land height is about 700 m about sea level and experimental design in use is Split-Split Plot Design. Three factors used as treatment in this experiment are paranet shade of without shade (0%), shade of 30%, and 50%, four cultivars potato (Granola, Atlantic, Spunta, dan Raja) and regulator, Paclobutrazol (0 ppm, 50 ppm, and 100 ppm). The result shows interaction between paranet shade, cultivar, and paclobutrazol are affecting to height of plants. Interaction between paranet shade and paclobutrazol is affecting to tuber amount. Cultivar Atlantic with 50% paranet shade without application paclobutrazol shows tallest plants that is 69,33 cm and the shortest is 33,83 cm at cultivar raja without paranet shade and application paclobutrazol 100 ppm. The results of this research proved that the growth of potato affects by cultivar, paranet shade, and paclobutrazol application. The best observed plant height of potato was Atlantic cultivar attempted with 50% density of shade without paclobutrazol application. Moreover, Atlantic cultivar showed higher Leaf Surface Area Index (LAI) and Net Assimilation Rate (NAR) value. Otherwise, the best yield was showed by Granola cultivar, so Granola can be counted as adaptable cultivar in medium plain.

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Keywords: Solanum tuberosum L; paclobutrazol;medium plain;paranet shade

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1. Introduction

Potato (*Solanum tuberosum* L.) is an important crop and has a priority in production because of its higher value than other crops, especially in Indonesia. The contribution of potato in Indonesia is more increasing either as fresh produce or as processed forms. In the future, potato used as a source of carbohydrate becomes a potential choice in food diversification to improve food resilience. Commonly, potato is grown in high plain (1000-3000 m above sea level) and concentrated in Java, South Sulawesi, North Sumatera, West Sumatera, and Jambi. In order to improve potato productivity, a new strategy is carried out with developing new area of potato plants in medium plains (300 – 700 m above sea level) which are provided abundant in Indonesia.

Development of potato planting in medium plain still has some problems. One of a major problem is none of adaptable cultivars to physical condition especially temperature and humidity. Thus, it is important to find a new potato cultivar with good adaptability in medium plain condition with higher temperature and lower humidity than higher plain. The main problem in potato planting is inadaptability of cultivars in environment stress affecting in very low productivity (Wibowo *et al.*, 2004). In order to overcome this problem, it needs some environment modification to give optimum condition of potato growth.

Yamaguchi (1991) has been reported that the best yield of potato was produced when it grown in soil temperature of 21^{o}C at night and 24^{o}C at noon. Soil temperature has important role to increase yield. Potato is a plant that its yield affected with soil temperature because of underground tuber production.

High soil temperature will limit tuberization and it will reduce tuber production. In addition, Adisarwanto (1990) reported that potato grown at higher temperature will reduce tuber weight and decrease the rate tuber formation. On the other hand, Nonnecke (1989) reported that if high temperature was happened along tuberization, so the tuber produced will have abnormal shaped. It was affected by development of new tuber formed before and it was called secondary tuber.

Modifications of environment are needed to support potato growth at medium plain. One of these modifications is providing paranet shade. Hamdani (2008) stated that paranet has good function not only to reduce light intensity but also to reduce air temperature. Potato is classified as C3 plant that needs moderate light radiation, so it needs to control density of paranet shade. External factors impact tuberization; besides, it is also the internal factors such as growth hormones and carbohydrate metabolism. High temperatures will accelerate gibberellic acid (GA) biosynthesis. In tuberization, GA has been proved to delay tuber initiation and stimulate vegetative growth. Application of Paclobutrazol on plant was reported to give the inhibition of GA biosynthesis (Wilkinson and Richard, 1991) and it will affect to increase tuberization.

Nomenclature

GA	Gibberellic Acid
LAI	Leaf Surface Area Index
NAR	Nett Assimilation Rate

2. Materials and methods

2.1. Materials

Four cultivars of potato seed, i.e. Granola, Atlantic, Spunta, and Raja were used in this experiment; besides, a growth stimulator, paclobutrazol and paranets with shade of 30% and 50%. Additional commercial fertilizers (urea, SP-36, KCl) and pesticides (Curacron 500 Ec, Antracol 250 Ec, and Dithane M-45) were also used.