PROMOTING GROWTH AND TUBER FORMATION OF POTATO PRODUCTION AT LOWLAND BENGKULU BY APPLYING ANTI-GA (GIBERELLIC ACID) AND LOWERING SOIL TEMPERATURES

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ABSTRACT

The overall goal of this experiment was to establish a technology for growing potato at the low elevation. There were three groups of experiment with its own separate objective. The first experiment was to determine the best time (1, 2, 3, and 4 week after emergence) for applying retardant at their effective concentration (4 ppm ANZ, 1200 ppm CCC, 50 ppm COU, and 4000 ppm PBZ) for promoting potato tuber formation. The second experiment was to determine the best combination of time for watering potato crops and time for applying retardant (Coumarin) to promote tuber formation. The third experiment was to find out the best mulch type in reducing soil temperatures. Results showed that each retardant had its own best timing for application, 12:00 WIB was the best time for watering potato crops, irrigation significantly reduce maximum soil temperatures, and silver mulch along with organic mulches were the best mulches for reducing maximum soil temperature.

INTRODUCTION

The centre production for potato (*Solanum tuberosum* L.) in Indonesian generally take places in highland altitude, such as Pengalengan, Lembang, and Cipanas (West Java), Dieng Highland (Cebtral Java), Batu (East Java), Brastagi (North Sumatera), and South Sulawesi highland (International Potato Center, 2001). This is agronomically well-understood since potato plants will optimally produce its tuber at the temperature of 17-20 °C (Haynes *et al.*, 1988; Stark and Love, 2003; Suharjo, 2006). Several Indonesian researchers, however, have tried to develop technology production of potato in lower altitude in order to increase national production of potato (Sutater *et al.*, 1987; Syarif, 2004; Wicaksana, 2001). Unfortunately, the results were unable to answer whether potato grown in lowland produces tubers as good as highland potato production.

According to Suharjo (2006) the main constraint for potato production in lowland altitudes is related to high temperatures, particularly night temperatures and soil temperatures. At high temperatures, the tuber formation (change from stolon to tuber) is significantly (Stark and Love, 2003), and increases the biosynthesis of gibberellic acid (GA) in leaf buds (Menzel, 1983). It has been well reported that GA inhibited the tuber formation (Vreugdenhil *et al.*, 1998). Many researchers, however, reported that the negative effects of GA can be removed by anti GA applications, such as CCC (Menzel, 1980; Mardalena, 2006), Ancymidol (Escalante and Langille, 1998), Paclobutrazol (Wang and Langille, 2005), or Coumarine (Andrianie, 2006). High temperatures also has been well-known to increase crop respiration, decrease rate of photosynthesis, decrease assimilate partitioning to roots and tubers, decrease sucrose conversion to starch (Reynold *et al.*, 1990; Sarquis *et al.*, 1996). These all significantly inhibit growth and tuber formation of potato plants.

High temperature decreased potato production by inhibiting starch synthesis in the tuber (Krauss and Marcheshner, 1984) or decrease the assimilate partitioning to tuber (Basu and Minhas, 1991), and increase assimilate partitioning the above-ground parts (Gawronska *et al.*, 1992). In addition, high air temperatures (30-35 °C) have bigger negative effects to the tuber formation than high soil temperatures do (Ewing and Struik, 1992). High soil temperatures will not inhibit the signaling for tuber formation, it will