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UTILIZATION OF LATEX SERUM AS RICE FERTILIZER

Miss Krongkaew Sakornrat

A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Science in Biotechnology

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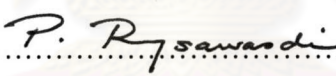
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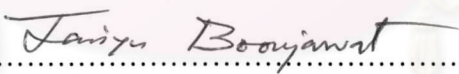
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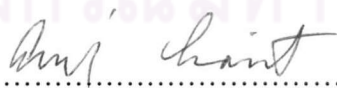

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การศึกษาผลของซีรัมจากน้ำยางขี้ (CS) และซีรัมจากน้ำยางขี้โปรตีนต่ำ (DS) ต่อการเจริญของต้นกล้าข้าว อายุ 7 วัน พันธุ์สุพรรณบุรี 1 และข้าวดอกมะลิ 105 โดยปลูกแบบไฮโดรโปนิกส์ในขวดที่บ่มที่มีน้ำประปาหรือสารละลาย Hoagland 150 มล. เป็นชุดควบคุม เปรียบเทียบกับซีรัมที่เจือจางในน้ำที่ความเข้มข้น 1%, 3%, 5%, 7% และ 9% พบว่าในช่วง 14 วันหลังปลูก ต้นข้าวเจริญได้ดีในสารละลาย Hoagland แต่เหลืองและตายใน 22 วัน ต้นข้าวที่ได้รับซีรัมทั้งสองชนิดเจริญได้ดีที่ความเข้มข้น 1%-3% และไม่ตายจนถึง 26 วัน สรุปผลได้ว่าซีรัมจากน้ำยางพาราใช้เป็นปุ๋ยสำหรับต้นกล้าข้าวได้ดีกว่าสารละลาย Hoagland ในการทดลองเพื่อศึกษาการเจริญของต้นข้าวและผลผลิตของข้าวสองพันธุ์ในกระถาง โดยใช้ชุดควบคุม คือ ปุ๋ยเคมี (N:P₂O₅:K₂O=16-20-0) ในอัตรา 30 ก.ก./ไร่ เทียบกับซีรัม 1-9% หรือปริมาณไนโตรเจนทั้งหมด 13-117 ก.ก./ไร่ แต่ละดำรับมี 10 ซ้ำ พบว่าพันธุ์สุพรรณบุรี 1 และข้าวดอกมะลิ 105 เจริญได้ดีในซีรัมจากน้ำยางขี้ความเข้มข้น 9% โดยให้น้ำหนักแห้งของดินเท่ากับ 1.3 เท่า และ 1.6 เท่า และให้ผลผลิตใกล้เคียงกับชุดควบคุม แต่การออกดอกช้ากว่าชุดควบคุม 16 วัน และ 10 วันตามลำดับ และซีรัมน้ำยางขี้จากกระบวนการปกติให้ผลผลิตสูงกว่าน้ำยางขี้โปรตีนต่ำอย่างมีนัยสำคัญ ดังนั้นจึงทดลองใช้ซีรัมร่วมกับปุ๋ยเคมีโดยกำหนดให้ปุ๋ยเคมี (16-20-0) 30 ก.ก./ไร่ เป็นร้อยละของปุ๋ยเคมี (100F) และซีรัมที่มีไนโตรเจนทั้งหมด 117 ก.ก./ไร่ เป็นร้อยละของซีรัม (100S) เทียบกับดำรับที่ปราศจากปุ๋ย และอีก 3 ดำรับการทดลอง คือ 25F+75S, 50F+50S และ 75F+25S พบว่าข้าวทั้งสองพันธุ์ที่ได้รับ 50F+50S มีการเจริญและผลผลิตดีที่สุด คือ 2.2 เท่าของ 100F และออกดอกช้ากว่า 5 วันในพันธุ์สุพรรณบุรี 1 และเร็วขึ้น 3 วันในข้าวขาวดอกมะลิ เมื่อเปรียบเทียบกับการใช้ซีรัมคงที่ 100S และเติมปุ๋ยเคมีที่ปริมาณเพิ่มขึ้น 10F, 25F และ 50F เทียบกับชุดควบคุมคือ 100F พบว่าดำรับ 100S+50F ดีที่สุดในข้าวทั้งสองพันธุ์คือให้น้ำหนักแห้งของดินและรากเพิ่มขึ้น 2-3 เท่าในข้าวขาวดอกมะลิและสุพรรณบุรี 1 ตามลำดับ และให้ผลผลิตเพิ่มขึ้น 1.8-2.8 เท่าของการใช้ปุ๋ยเคมีอย่างเดียว (100F) ส่วนการออกดอกเร็วขึ้น 2 วันในข้าวขาวดอกมะลิและช้ากว่า 6 วันในพันธุ์สุพรรณบุรี 1 นอกจากผลผลิตเพิ่มขึ้นแล้วผลการวิเคราะห์องค์ประกอบทางเคมีแสดงว่าการใช้ซีรัมจากน้ำยางพาราทำให้ปริมาณไนโตรเจนในฟางและเมล็ดของข้าวทั้งสองพันธุ์เพิ่มขึ้นอย่างมีนัยสำคัญทางสถิติ และไม่มีผลต่อความเข้มข้นของสังกะสีในฟาง เมล็ด และดินที่ใช้ปลูกแต่อย่างใด จึงสรุปได้ว่าการใช้ซีรัมจากน้ำยางพาราที่มีปริมาณไนโตรเจน 58 ก.ก./ไร่ ร่วมกับปุ๋ยเคมี (N:P₂O₅:K₂O=16-20-0) 15 ก.ก./ไร่ เป็นปุ๋ยในการปลูกข้าวให้ผลผลิตข้าวสูงสุดและช่วยเพิ่มปริมาณไนโตรเจนในเมล็ดและฟางอีกด้วย

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สาขาวิชา เทคโนโลยีชีวภาพ
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ลายมือชื่อนิสิต..... กสอจกแก้ว นาดรรักษ์
ลายมือชื่ออาจารย์ที่ปรึกษา.....
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To investigate the effects of control latex serum (CS) and deproteinized latex serum (DS) on growth of rice seedlings in hydroponic culture, the 7 day-old rice seedlings cv. Suphan Buri 1 (SPR 1) and Khao Dawk Mali 105 (KDML 105) were cultured in 150 ml opaque bottles, which contained tap water and Hoagland solution compared with 1%, 3%, 5%, 7% and 9% of both latex sera. During 14 days after germination, the rice plants were rapidly grown in Hoagland solution but they became yellow and died at 22 days. Both rice cultivars responded best to 1%-3% of both sera until 26 days. The results indicated that latex sera can be used for rice seedlings better than Hoagland solution. The effect of both sera on growth and yield of these two rice cultivars was investigated in pot experiment using 30 kg/rai of ammonium phosphate fertilizer (N:P₂O₅:K₂O=16-20-0) as control treatment comparing with 1-9% latex serum (13-117 kgN/rai) with ten replications. The results indicated that 9% CS promoted shoot growth about 1.3 fold and 1.6 fold in SPR 1 and KDML 105, respectively compared with control treatment. It also produced more or less similar grain yield but showed 16 and 10 days delay flowering time, respectively compared with chemical fertilizer. Control serum gave significantly higher yield than deproteinized serum. Accordingly, the effect of CS in combination with ammonium phosphate fertilizer on growth and yield was studied by defining that 100F is application of 30 kg/rai ammonium phosphate fertilizer 16-20-0 and 100S is 117 kgN/rai of latex serum compared with untreated control, 25F+75S, 50F+50S and 75F+25S. The results showed that both rice cultivars applied with 50F+50S produced the highest shoot dry weight and produced grain yield of 2.2 fold over that of 100F. It showed 5 days delay flowering time in SPR 1 and 3 days earlier in KDML 105. In comparison, fixed amount of 100S, added with increase chemical fertilizer 10F, 25F and 50F was performed comparing with 100F. The results indicated that 100S+50F was the best treatment as evident by maximum increase of shoot and root dry weights 2-3 fold over that of 100F and grain yield of 1.8-2.8 fold in KDML 105 and SPR 1, respectively. Flowering was 2 days earlier in KDML 105 and 6 days delay in SPR 1. Besides highest grain yield, analysis of chemical composition indicated that latex serum increased level of nitrogen content in the straws and seeds significantly. Apparently, latex serum did not affect Zn content in the straws, seeds and soils. It can be concluded that when applied 58 kgN/rai of latex serum in combination with 15 kg/rai ammonium phosphate fertilizer (16-20-0), rice plants produced the maximal grain yield and increased N content in the straws and seeds.

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ABBREVIATIONS

AAS	Atomic Absorption Spectrophotometer
BOD	biological oxygen demand
COD	chemical oxygen demand
CRD	completely randomized design
CS	control serum
°C	degree Celsius
cm	centimeter
DAG	days after germination
DAHP	diammonium hydrogen phosphate
DMRT	Duncan's new multiple range test
DS	deproteinized serum
g	gram
KDML 105	Khao Dawk Mali 105
L	litre
µL	microlitre
µg	microgram
M	molar
min	minute
mL	millilitre
mg	milligram
N	normality
ND	not determined
nm	nanometer
ppm	part per million
ppmv	part per million by volume
ppmw	part per million by weight
r	replication
RRIM	Rubber Research Institute of Malaysia
SPR 1	Suphan Buri 1
s	second
SDBS	sodium dodecyl benzene sulfonate
TMTD	tetramethylthiuram disulfide
v/v	volume by volume
w/v	weight by volume