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**COATING OF UREA FERTILIZER WITH CARDANOL**

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ปิยะนันท์ พัฒนาศิริเสรี : การเคลือบปุ๋ยยูเรียด้วยคาร์ดานอล (COATING OF UREA FERTILIZER WITH CARDANOL) อ.ที่ปรีกษาวิทยานิพนธ์หลัก : รศ.ดร.อมร เพชรสม, 105 หน้า.

ได้ทำการศึกษาวิจัยควบคุมการปลดปล่อยที่เคลือบด้วยคาร์ดานอล โดยเปรียบเทียบสมบัติต่างๆของฟิล์ม เช่น เวลาในการแห้งตัว ความแข็ง การยึดเกาะ ความเงางาม การทนน้ำ และการทนกรด/ด่างของฟิล์มที่เตรียมจากคาร์ดานอล เช่น คาร์ดานอลที่ผ่านกระบวนการพรีพอลิเมอไรเซชัน คาร์ดานอลที่ผ่านกระบวนการพรีพอลิเมอไรเซชันที่ผสมกับน้ำมันชักแห้งชนิดต่างๆ เช่นน้ำมันดั่ง น้ำมันลินสีด และคาร์ดานอล-พอร์มัลดีไฮด์เรซิน จากนั้นเลือกเวลาที่สั้นที่สุด พบว่าของผสมระหว่างคาร์ดานอลที่ผ่านกระบวนการพรีพอลิเมอไรเซชันและน้ำมันดั่งในสัดส่วน 9:1 (น้ำหนัก/น้ำหนัก) ที่ 80 องศาเซลเซียส ให้เวลาแห้งตัวที่สั้นที่สุดและได้รับเลือกให้เป็นวัสดุเคลือบต่อไป ปริมาณวัสดุเคลือบที่เหมาะสมที่สุดคือ 6 % โดยน้ำหนักของปุ๋ย และใช้โคบอลต์แอฟทีเนต และเทอร์เทียรีบิวทิลไฮโดรเปอร์ออกไซด์ ที่ 6 % ของวัสดุเคลือบเป็นตัวเร่งปฏิกิริยา ปุ๋ยยูเรียที่เคลือบแล้วจะมีเปลือกหุ้มที่แข็ง เป็นเงางาม และไม่ละลายน้ำ จากการศึกษาการปลดปล่อยธาตุอาหาร พบว่า ปุ๋ยยูเรียที่เคลือบแล้วจะทำให้การปลดปล่อยที่ช้ากว่ายูเรียที่ไม่ได้เคลือบ อุณหภูมิสูงเร่งการปลดปล่อยยูเรียขณะที่ภาวะความเป็นด่างจะชะลอการปลดปล่อย นอกจากนี้ยังพบว่ายูเรียที่ปลดปล่อยจากปุ๋ยที่เคลือบด้วยของผสมระหว่างคาร์ดานอลที่ผ่านกระบวนการพรีพอลิเมอไรเซชัน และน้ำมันดั่งที่ความหนาประมาณ 125 ไมครอนจะสามารถปลดปล่อยปุ๋ยได้นานถึง 3 เดือน

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Controlled release urea coated with cardanol was investigated. Film properties such as drying time, hardness, adhesion, glossiness, water resistant and acid/base resistant of various cardanol based films for example, film prepared from prepolymerization cardanol, prepolymerization cardanol blended with drying oils such as tung oil, linseed oil and cardanol-formaldehyde resin were compared. Then the shortest drying time for coating was selected. It was found that a mixture of prepolymerization cardanol and tung oil at ratio 9:1 (w/w) at 80 celcius gave the shortest drying time and it was selected as a coating material. The most suitable amount of coating material was 6 % by weight of fertilizer. Cobalt naphthenate and tertiary butylhydroperoxide at 6 % (w/w) of coating material were used as catalyst. The coated urea had hard coating film, glossy and did not dissolve in water. When the nutrient release was investigated, it was found that coated urea gave lower release rate than uncoated urea. Moreover, the thicker coated film gave slower release rate. The high temperature accelerated urea release while alkaline condition retarded release rate. In addition, it was found that urea release from fertilizer coated with a mixture of prepolymerization cardanol and tung oil at approximate 125 micron thickness could be prolonged to three months.

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## LIST OF ABBREVIATIONS

ASTM	American Society for Testing and Materials
C	carbon
CHCl <sub>3</sub>	chloroform
cm	centimeter
cm <sup>-1</sup>	wavenumber
CNSL	cashew nut shell liquid
°C	degree Celsius
DMAB	<i>p</i> -dimethylaminobenzaldehyde
DI	deionized
FT-IR	Fourier Transform Infrared Spectrophotometer
g	gram
GPC	Gel Permeation Chromatography
h	hour
H <sub>2</sub> O <sub>2</sub>	Hydrogen peroxide
mg	milligram
min	minute
mL	millilitre
mmol	milimole
MW	molecular weight
N	normality
nm	nanometer
NMR	Nuclear Magnetic Resonance Spectrometer
salen	N,N-ethylenebis(salicylidene-aminato)
SEM	Scanning Electron Microscope
S.D.	The standard deviation
UV	Ultraviolet
w/w	weight by weight
%	percent