



# จดหมายข่าวคณะวิทยาศาสตร์

"เป็นคณะวิทยาศาสตร์ชั้นนำที่โดดเด่นด้านศาสตร์ทางทะเล และการสร้างนวัตกรรมในระดับอาเซียน"

ฉบับพิเศษที่ ๑/๒๕๖๒

เรื่อง "Controlled-release fertilizer based on biodegradable hydrogel"  
รางวัล **Bronze Medal** ในงาน "The 47<sup>th</sup> International Exhibition of Inventions Geneva"

คณะวิทยาศาสตร์ ขอแสดงความยินดีกับ **รศ.ดร.สุปราณี แก้วภิรมย์**  
อาจารย์ภาควิชาเคมี คณะวิทยาศาสตร์ มหาวิทยาลัยบูรพา  
ได้รับรางวัล **Bronze Medal** ผลงานเรื่อง **"Controlled-release fertilizer based on biodegradable hydrogel"**  
ในงาน **The 47<sup>th</sup> International Exhibition of Inventions Geneva**  
วันที่ 10-14 เมษายน 2562 ณ นครเจนีวา ประเทศสมาพันธรัฐสวิส



*Controlled-release fertilizer hydrogels were prepared from biodegradable polymers namely, chitosan and polyvinyl alcohol. The water sorption efficiency of soil and slowly release out nutrients. Therefore, the nutrients at appropriate amount, without causing any environmental contamination.*



## How to Apply?

Like conventional chemical fertilizers, there are different ways to apply the controlled-release fertilizer hydrogel, for examples, 1) bury in the basement before planting, 2) bury in soil at the levels that plant roots can reach in each state of their life cycles, 3) spread out on soil surface, and 4) put into the water (for aquatic plant). After watering, the controlled-release fertilizer hydrogel will adsorb water and swells. The chemicals inside the hydrogel then dissolve in the water, resulting in the difference in nutrient concentration at the inside and the outside of the hydrogel structure. As a consequence, the nutrients diffuse into the soil where they can be absorbed by plant roots. This technology can also be applied to other chemicals, hormone, or essential oil, where controlled-release mechanism is needed to be used.

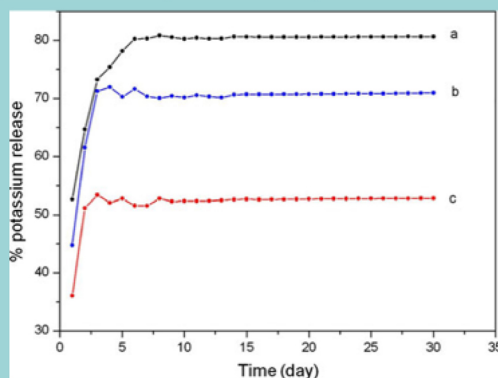
## Advantages

1) Controllable release rate that nutrients can be consumed efficiently by plant. 2) Reduce chemical contamination in the environment leading to better quality of lives for both farmers and other people. 3) Reduce cultivation cost due to the increased fertilizer application efficiency and reduced number of fertilizer application per crop. 4) Can be degraded after use. 5) Helps to increase soil aeration and composes into organic matters without any environmental effect.

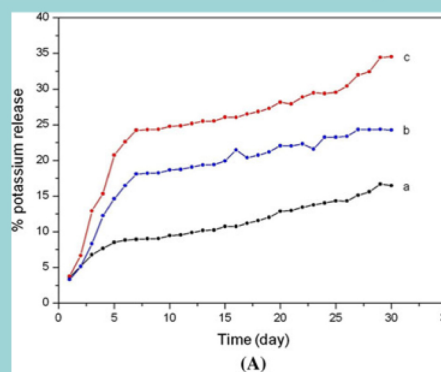


The degradation after 3 months in water (left) compared with the first day in water (right).

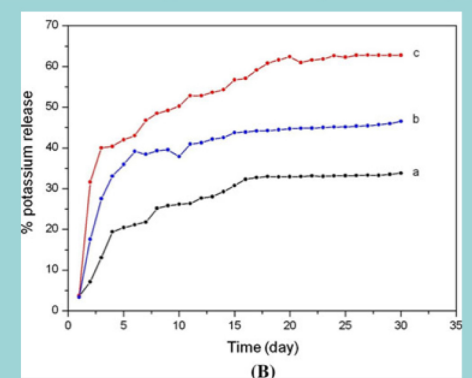
## CRF hydrogel Releasing Behavior



Release behavior of potassium in water from (a) PVA hydrogel, (b) PVA/CS hydrogel and (c) CS hydrogel.



Release behavior of potassium from (a) PVA hydrogel, (b) PVA/CS hydrogel and (c) CS hydrogel into soil (A) pH 4.1 and (B) pH 7.3



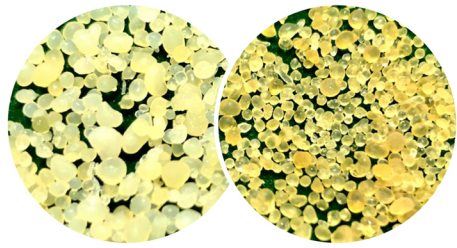
## The Cultivation of Hot Chilli in Thailand

Crop cycle = 120 Days for the area of 1 Rai (1 Rai = 1,600 m<sup>2</sup>)



	Fertilizer application duration (per crop)	Frequency (per crop)	Fertilizer quantity (per crop)	Price of the fertilizer (THB per kilogram)	Fertilizer expenditure (THB per crop)
Conventional fertilizer (Viking brand)	Every 15 days (20 Kg)	8	160 Kg	153	24,480
CRF hydrogel	Every 30 days (20 Kg)	4	80 Kg	174	13,920 (>40% reduction)

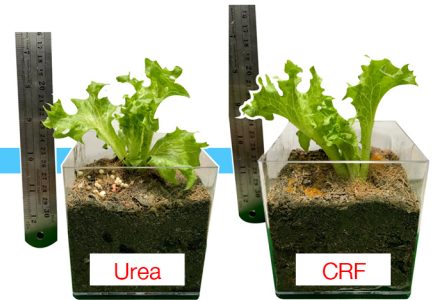
\*Resource: Intellectual Property and Technology Transfer Center, Burapha University



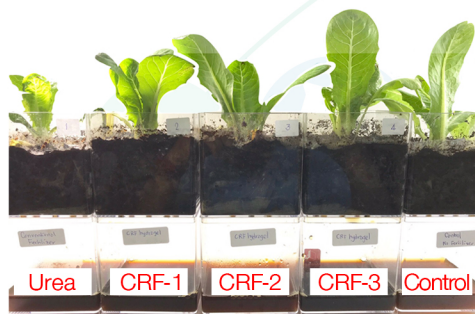
Controlled-released fertilizer based on chitosan hydrogel after swelling in water (left) compared with dry state (right).



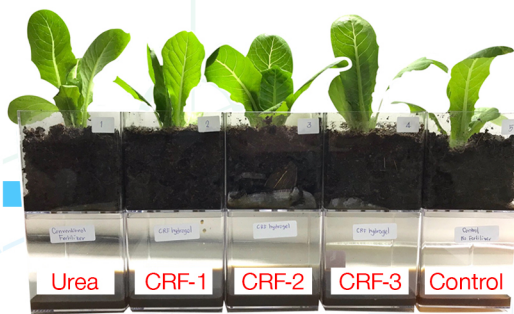
The degradation after 3 months in water (left) compared with the first day in water (right).



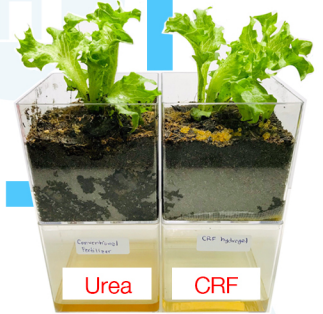
The conventional fertilizer and the CRF hydrogel before watering.



Cos lettuce at Day 5 of the fertilizer application (1 g of fertilizer in 200 g of soil).



Cos lettuce at Day 1 of the fertilizer application (1 g of fertilizer in 200 g of soil).



The conventional fertilizer and the CRF hydrogel after watering.



The CRF hydrogel can be applied for water plants.



The CRF hydrogel can be applied as nutrient/ water source for sandy soil.



The CRF hydrogel can be produced at various sizes.

## Target Users

Farmers, gardener, chemical/ organic fertilizer manufacturers, commercial agents. Etc.

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CRF biodegradable hydrogel