

# Application of Response Surface Methodology to Optimize Maceration Extraction of Antioxidants from *Cosmos caudatus*

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## Overview

***Cosmos caudatus*** ~ *C. Caudatus* has traditionally been used to boost blood circulation, strengthen the bones, reduce body heat, and treat infectious disease.<sup>1</sup> *C. Caudatus* has been proclaimed as a high source of bioactive compounds such as chlorogenic acid, quercetin and ascorbic acid. Reported evidence indicated that *C. caudatus* exhibits high antioxidant activities.<sup>2</sup>

**Maceration** ~ Maceration is traditional and less complex procedure of extraction of compounds from plant material. Maceration is influenced by numerous factors such as temperature, time, alcohol content, conditions of maturation, speed, temperature and type of solvent.

**Response Surface Methodology (RSM)** ~ RSM is a collection of mathematical and statistical techniques widely applied in the food industry to evaluate the relationship between the predicted values of independent and dependent variables.<sup>3</sup> It is an effective tool for optimizing the process when many factors and interactions affect responses.

**Challenge** - Various factors may affect the efficiency of the extraction process. Each plant has its unique properties. Thus, it is important find optimum conditions for maceration extraction of *C. caudatus*.

**Objective** ~ To study the effect of ethanol

concentration and extraction time on yield and DPPH scavenging activity of *C. Caudatus* by maceration extraction. The optimum conditions for maceration extraction of *C. Caudatus* were identified.



*Cosmos caudatus*

## Experimental

### Material



- Drying at 55 °C for 6 h
- Ground into a powder using a dry blender
- Powder was kept in refrigerator



### Experimental Design

Independent variables	Units	Symbols	Coded level		
			-1	0	+1
Extraction time	h	X <sub>1</sub>	6	15	24
Ethanol concentration	%	X <sub>2</sub>	30	65	100

## Experimental

### Maceration extraction of *C. Caudatus*

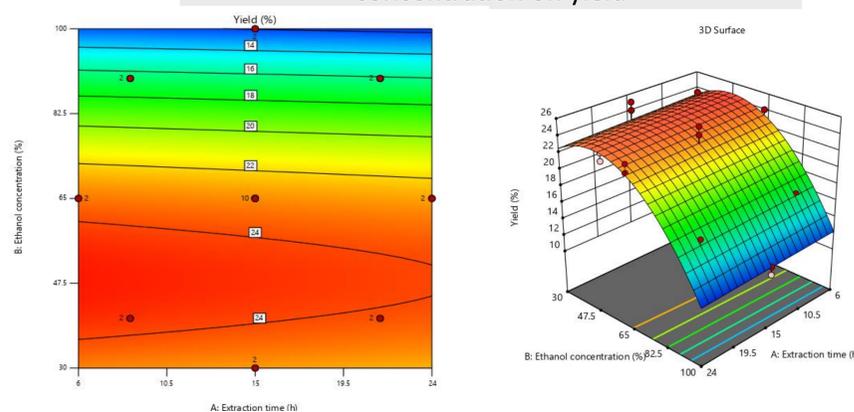


- 5g sample
- After extraction: filtered through filter paper

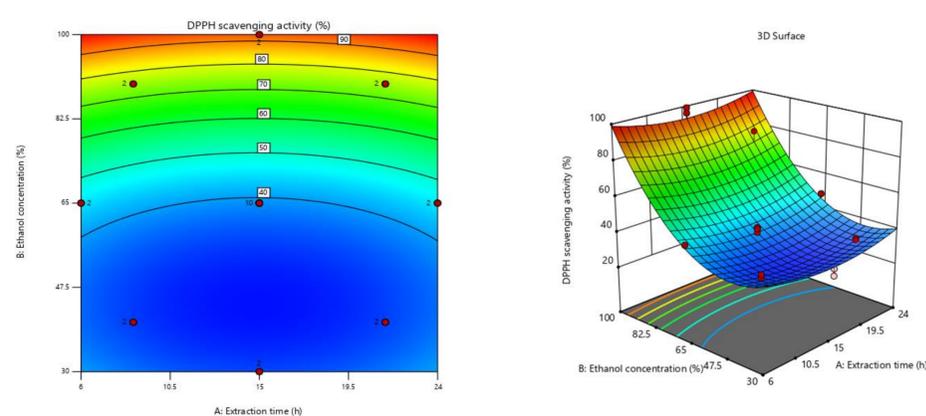
- Rotary evaporator to remove solvent
- Stored in dark condition at 4 °C

## Results

### Effect of extraction time and ethanol concentration on yield



### Effect of ethanol concentration and extraction time on DPPH scavenging activity



### Optimal conditions

Ethanol percentage, %	Extraction time, h	Yield, %		DPPH scavenging activity, %	
		Actual	Predicted	Actual	Predicted
84	24	18±0.24	18	62±0.41	67

## Conclusions

The results showed that yield was only influenced by ethanol concentration. Both extraction time and ethanol concentration significantly affected towards DPPH scavenging activity. Under the optimal condition of 84 % ethanol and 24 h extraction time, the predicted values were found to at 18 % and 62 % respectively for yield and DPPH scavenging activity.

## References

- 1.D. A Mohd Bukhari, M. J. Siddique, S. H. Shamsudin, M. M. Rahman, S. Z. M. So'ad, *Journal of Pharmacy & Bioallied Sciences* 2017, 9 (3), 164-170.
- 2.S. F. Seyedreihani, T.-C. Tan, A. F. M. Alkarkhi, A. M. Easa, *International Journal of Food Properties* 2017, 20(2), 260-270
- 3.M. Yolmeh, S. M. Jafari, *Food and Bioprocess Technology* 2017, 10(3), 413-433.