



GE105

Introduction to Engineering Design

College of Engineering

King Saud University

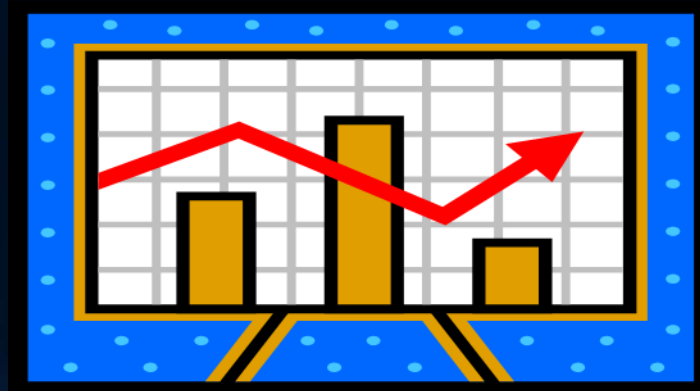
Studio 10.

- 1. How to prepare Posters***
- 2. Concept Generation and Evaluation***

SPRING 2016

Guide for Poster Design

- Size A0 (Portrait/Vertical)
- Can use Microsoft PowerPoint to design it
- Apply The 20-40-40 Rule
 - 20% Text
 - 40% Graphics
 - 40% White Space
- Use Heavy lines for ease in viewing
- Should be easy to read from more than one meter away
away



Font Types, Use and Size

Font Use	Font Size
Title	96 pt
Authors	72 pt
Affiliations	36-48 pt
Section Header	32 pt
Text	24 pt
Acknowledgments	18 pt

Suggested Font Type:

Tahoma Helvetica Palatino Arial Times New Roman

Poster Mandatory Contents

Your poster should include:

- A descriptive title
- Overview of the design project
- What? How? Why?
- Primary and secondary objectives
- Constraints and criteria
- Human factors
- Creative component
- Generated concepts
- Concept evaluation
- Conclusions
- Acknowledgements

Some Advices:

- Photographs as backgrounds lose quality when enlarged (use 150-300 dpi resolution)
- Dark backgrounds are easier on the eye but use more ink
- Colored backgrounds can often break the monotony of white posters, thus attracting a viewer
- Use light backgrounds with dark photos and vice versa
- Neutral/gray backgrounds enhance color photos while white backgrounds reduce their impact.

Be creative...



Marine Mammal Observer Association

"Setting the Standard for Marine Mammal Observation Worldwide"

Who We Are
A non-profit membership based global affiliation representing and supporting professional Marine Mammal Observers (MMOs) and Passive Acoustic Monitoring (PAM) Operators who implement mitigation measures to protect marine life during offshore industry operations.

Who We Work With
MMOA aims to work with industry, government agencies, non-government organizations and academics to improve the profession's effectiveness.

MMOA Aims

- Developing professional competency
- Improving collection and use of data
- Assimilating field experience and knowledge of MMOs
- Providing a collective voice for MMOs
- Providing constructive feedback on the implementation of mitigation guidelines to regional regulatory bodies
- Promoting the MMO profession in the offshore industry
- Improving protection for marine mammals

Membership Type

FULL
Open to qualified and experienced MMOs and PAM Operators

Benefits include:

- Recognized as competent professionals
- Access to a MMO Forum to share knowledge and experience
- Access to the Information Directory
- Influence the future development of the profession
- Contribute to the aims and objectives of the MMOA
- Full voting rights on the Association

ASSOCIATE
Open to students, prospective MMOs, newly qualified MMOs, company employees and individuals with an interest in MMO issues.

Benefits include:

- Access to the Information Directory
- Influence the future development of the profession
- Contribute to the aims and objectives of the MMOA
- Invited to comment on MMO issues

Corporate Sponsorship
This is welcomed to help achieve the aims and objectives of the MMOA. Corporate sponsors will have their company logo displayed on the website.


Please visit our website for further information www.MMO-Association.org

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ANTIOXIDANT ACTIVITY OF ANTHOCYANINS OF *Syzygium cumini* FRUIT

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ABSTRACT

The aim of this study was to determine the potency of jambolan (*Syzygium cumini*) fruit anthocyanins as antioxidant by evaluating their antioxidant activity using *in vitro* assays. Several different assays of the antioxidant activity including DPPH radical-scavenging assay, hydroxyl radical-scavenging assay, superoxide radical-scavenging assay, and lipid peroxidation assay using human low density lipoprotein have been conducted. The phenolic compounds in methanolic extract were separated by using a solid phase extraction (C18 Sep-Pac cartridge), providing: (1) anthocyanin phenolic fraction and (2) non-anthocyanin phenolic fraction. The phenolic content and antioxidant activity of the fractions have been compared with that of the methanolic extract. The phenolic content of anthocyanin-phenolic fraction represented approximately 63% (w/w) to the phenolic content of methanolic extract. The antioxidant activity of anthocyanin-phenolic fraction was slightly higher than that of methanolic extract. The antioxidant activity of jambolan extract was mainly contributed by anthocyanins. Moreover, anthocyanins extracted from the jambolan pulp, jambolan peel, and anthocyanin fraction were also evaluated their antioxidant activity. Jambolan pulp extract (JPuE), jambolan peel extract (JPnE), and jambolan anthocyanin fraction (JAF) exhibited significant antioxidant activities, in descending order: JAF > JPnE > JPuE. Among jambolan samples, jambolan anthocyanin fraction was the most effective as antioxidant and the antioxidant activity approached the activity of the standard compounds, quercetin, catechin, ascorbic acid. These results suggest that anthocyanins contained in the jambolan fruit with antioxidative properties are potential utilized for functional natural food colorants and nutraceutical.

Keyword: *Syzygium cumini* fruit, jambolan, anthocyanin, antioxidant

INTRODUCTION

Jambolan (*Syzygium cumini*) fruit is rich in anthocyanin pigments especially in its peel part. Anthocyanins of jambolan fruit have been studied extensively in our laboratory. Jambolan anthocyanins have been identified as 3,5-diglucoside derivatives of delphinidin (41.29%), petunidin (27.79%), malvidin (25.60%), cyanidin (4.19%), & peonidin (1.13%). Other study exhibit that jambolan anthocyanins have better color stability than anthocyanins commercial anthocyanin colorant from grape peel. Through intermolecular copigmentation reaction with ferulic acid, sinapic acid, caffeic acid, and rosmarin polyphenol extract, color and stability of jambolan anthocyanins can be increased. In the present study, the antioxidant activity of jambolan anthocyanins was evaluated using several different *in vitro* assays.

RESULTS

Contribution of Jambolan Anthocyanins as Antioxidant

Sample	Total phenolic content (mg GAE/g)	Antioxidant capacity (IC ₅₀ (µg/ml))
Methanolic extract	28.75 ± 0.26	10.10
Anthocyanin-phenolic fraction	21.07 ± 0.21	10.10
Non-anthocyanin phenolic fraction	6.68 ± 0.05	10.10

The phenolic content of anthocyanin-phenolic fraction represented approximately 63% (w/w) to the phenolic content of methanolic extract. The antioxidant activity of anthocyanin-phenolic fraction was slightly higher than that of methanolic extract. Thus, the antioxidant activity of jambolan extract was mainly contributed by anthocyanins.

Antioxidant Activity of Extract and Anthocyanin Fraction

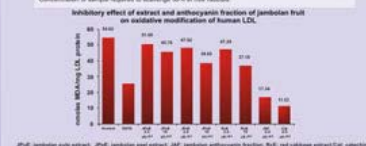
Sample	Total phenolic content (mg GAE/g)	Total phenolic (mg GAE/g)
Jambolan pulp extract (JPuE)	15.86 ± 0.10	15.86 ± 0.10
Jambolan peel extract (JPnE)	27.62 ± 1.42	27.62 ± 1.42
Jambolan anthocyanin fraction (JAF)	37.94 ± 0.52	27.70 ± 0.48
Red cabbage extract (RcE)	27.70 ± 0.48	27.70 ± 0.48

Gallic acid equivalents (by weight basis).

Sample	DPPH radical (IC ₅₀ (µg/ml))	Superoxide radical (IC ₅₀ (µg/ml))	Hydroxyl radical (IC ₅₀ (µg/ml))
Jambolan pulp extract (JPuE)	1756.88 ± 11.73	25.56 ± 0.88	449.48 ± 19.12
Jambolan peel extract (JPnE)	1818.88 ± 8.52	22.58 ± 0.80	397.19 ± 19.84
Jambolan anthocyanin fraction (JAF)	23.02 ± 0.88	1.85 ± 0.04	257.27 ± 4.30
Red cabbage extract (RcE)	424.54 ± 11.36	20.67 ± 0.33	322.65 ± 16.54
Quercetin	16.89 ± 0.20	1.27 ± 0.04	167.52 ± 2.83
Ascorbic acid	5.20 ± 0.25	0.35 ± 0.01	-
Ascorbic acid	13.48 ± 0.08	0.59 ± 0.06	-

Concentration of sample required to scavenge 50% of free radicals.

Inhibitory effect of extract and anthocyanin fraction of jambolan fruit on oxidative modification of human LDL



JPuE: Jambolan pulp extract, JPnE: Jambolan peel extract, JAF: Jambolan anthocyanin fraction, RcE: Red cabbage extract (Control).
 Concentration: 100 µg/ml, 200 µg/ml, 400 µg/ml, 800 µg/ml, 1600 µg/ml.

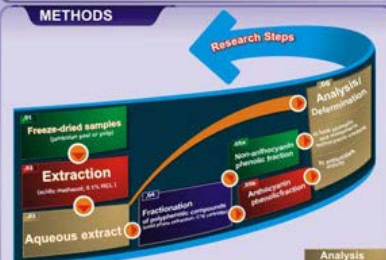
Antioxidant Activity of Model Beverage

Total phenolic content, anthocyanin content, and antioxidant capacity of model beverage

Sample	Total phenolic content (mg GAE/g)	Antioxidant capacity (IC ₅₀ (µg/ml))
Anthocyanin fraction (JAF)	104.75	104.84
Total phenolic	104.75	104.84

Jambolan pulp extract (JPuE), jambolan peel extract (JPnE), and jambolan anthocyanin fraction (JAF) exhibited significant antioxidant activities, in descending order: JAF > JPnE > JPuE. Jambolan anthocyanin fraction (JAF) was the most effective as antioxidant and the antioxidant activity approached the activity of the standard compounds, quercetin, catechin, ascorbic acid. Jambolan anthocyanins that added to a model beverage as colorant also exhibited antioxidant activity.

METHODS



Fractionation of Jambolan Phenolics

Sample	Total phenolic content (mg GAE/g)	Anthocyanin content (mg GAE/g)
Methanolic extract	28.75 ± 0.26	18.13 ± 0.17
Anthocyanin-phenolic fraction	18.13 ± 0.17	18.13 ± 0.17
Non-anthocyanin phenolic fraction	10.62 ± 0.09	0.00 ± 0.00

Analysis

Free radical scavenging activity (expressed as IC₅₀ values)

IC₅₀ (µg/ml): DPPH radical, Superoxide radical, Hydroxyl radical

CONCLUSION

The antioxidant activity of jambolan fruit was mainly contributed by anthocyanin. The phenolic extract and anthocyanin fraction of jambolan fruit were effective both in scavenging reactive oxygen species (ROS) and in inhibiting lipoprotein oxidation. The anthocyanins of jambolan fruit with antioxidative properties are potential utilized for functional natural food colorants and nutraceutical.

ACKNOWLEDGEMENT

Poojita Sasi is grateful to the International Foundation for Science (IFS), Stockholm, Sweden and Organization for the Prohibition of Chemical Weapons (OPCW), The Hague. The Netherlands for the financial support.

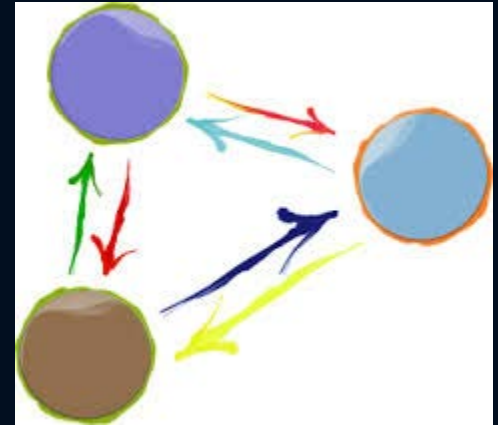
END of part one

....next

**(concept generation and
evaluation)**

Reminder: Morphological Analysis

- The problem is divided into smaller sub-problems.
- Concepts are generated to satisfy each smaller problem.
- A four-step process
 1. list the functions and features required
 2. Identify as many ways as possible for each feature or function
 3. Draw a table with functions listed vertically and features or concepts listed horizontally
 4. Identify all practical combinations



Reminder: Morphological Analysis (Example)

Design a means of transportation for disabled persons

Feature	Concept 1	Concept 2	Concept 3	Concept 4
Body Support	armchair	under arm	leg support	sofa
Ground Support	rollers	tracks	wheels	skids
Power Supply	Battery	solar	human	air
Speed Control	automatic	manual	on-off	-
Direction Control	side thrust	one side lock	reverse	Steering

Design 1: Armchair + Rollers + Solar + Automatic + Side-thrust

Design 2: Armchair + Wheels + Human + Manual + Steering

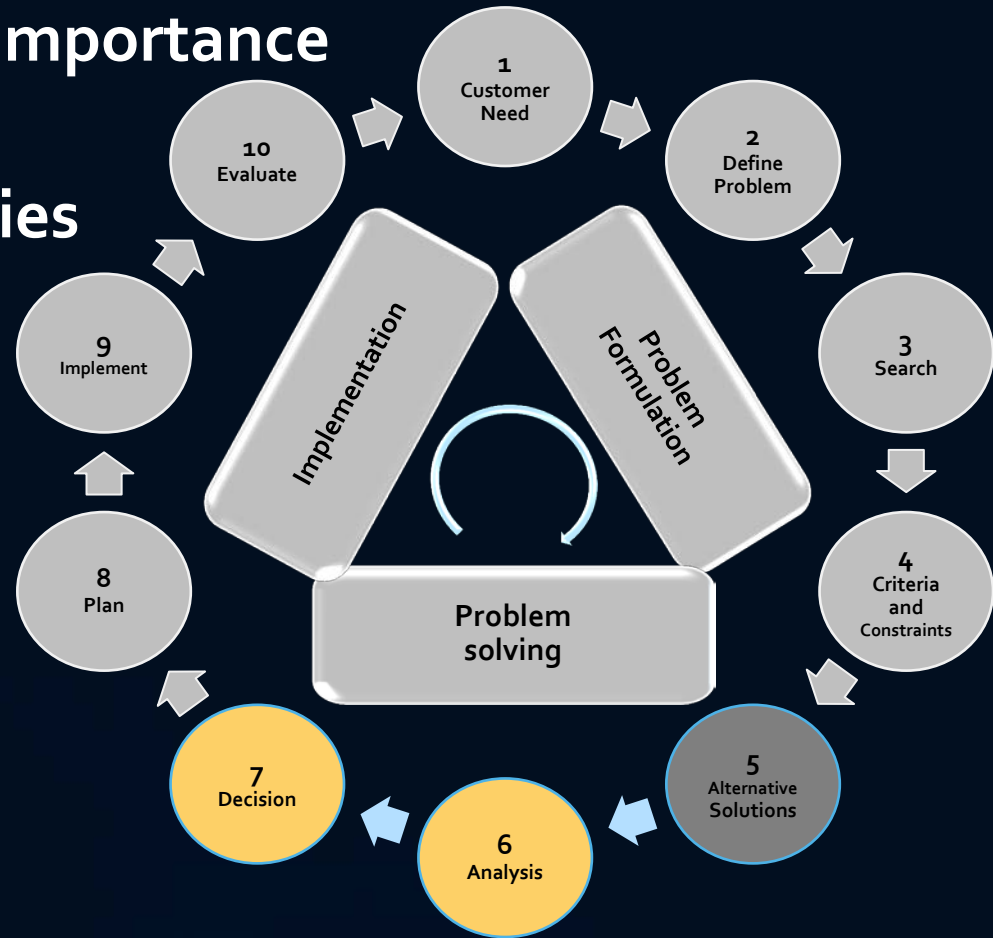
Reminder: Concept Evaluation

- Characteristics of Engineering Decisions

- Multiple criteria
- Criteria are of different importance
- Criteria are conflicting
- Multiple interested parties



- Use a Decision Matrix:
A simple decision approach to weigh pros and cons applying **weight and rate** concept (multiply and sum)



Weights

- To determine the importance of each attribute, we use a simple approach based on weights that sum to 100

	Direct Energy	Manufacturability	Flexibility	Holding Energy in Oven	Total Weight
Scenario 1: Compromise	25	25	25	25	100%
Scenario 2: Most light in	40	5	15	40	100%
Scenario 3: Easy to make	20	40	20	20	100%

Rating the Concepts

- This scenario uses weights (40,5,15,40)

	Direct Energy	Manufac turability	Flexibility	Holding Energy in Oven	Score
Weights→	40	5	15	40	
Concept 1: No reflector Big window	1	10	5	3	285
	40	50	75	120	
Concept 2: 1 reflector Small window	4	8	7	6	545
	160	40	105	240	
Concept 3: Parabolic	9	2	4	4	590★
	360	10	60	160	

Group Activity

- **Part 1: 40minutes**
- Each group generates concepts for their final design project using morphological analysis
- At least three alternatives must be generated

- **Part 2: 20minutes**
- Use the weight-and-rate to evaluate your concepts

- **Part 3: 15minutes**
- Present your work to the Instructor and your peers in class