COMPARISON OF DIFFERENT EXTRACTION METHODS OF PHENOLIC COMPOUNDS FROM BAY LEAF (*LAURUS NOBILIS* L.)

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PRESENTATION FLOW

-Introduction
-Materials and Methods
-Results and Discussion
-Conclusion
-References

INTRODUCTION

- ✓Bay leaf (*Laurus nobilis* L.)
  - ✓Oldest known spice
  - ✓Alternative medicine
    - ✓Antioxidant
    - ✓Antimicrobial
    - ✓Anti-inflammatory
    - ✓Cytotoxic
    - ✓Anti-asthmatic
    - ✓Anti-arthritic
    - ✓Analgesic

(Sayyah et al., 2003; Kaileh et al., 2007; Lee et al., 2013).

BIOACTIVE COMPOUNDS

- ✓Called as phytochemicals
- ✓Secondary metabolites
  - ✓Carotenoids
  - ✓Anthocyanins
  - ✓Phenolic compounds

(Kris-Etherton et al., 2002)

PHENOLIC COMPOUNDS

- ✓Secondary metabolite
- ✓Positive health effect
- ✓Organoleptic properties
  - ✓color,
  - ✓taste,
  - ✓odor,
  - ✓nutritional quality
- ✓Natural antioxidant
- ✓Natural colorant

(Dai and Mumper, 2010; Ignat et al., 2011)

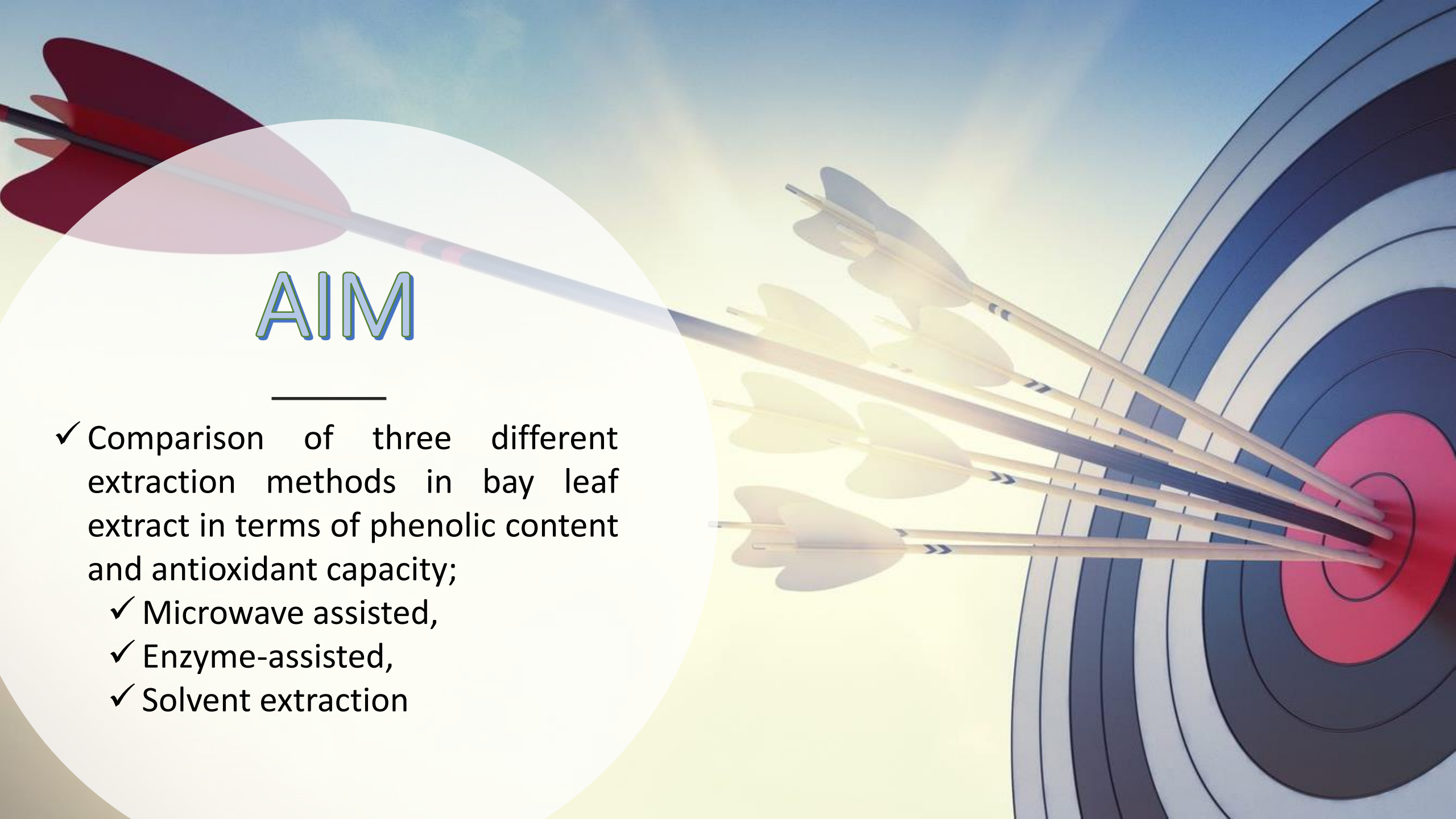
- ✓ Conventional (solvent) extraction
  - ✓ Long time
  - ✓ Excess solvent
  - ✓ Low yield

- ✓ Alternative extraction methods
  - ✓ Enzyme assisted extraction
  - ✓ Microwave assisted extraction
  - ✓ Ultrasound assisted extraction
  - ✓ Supercrtical extraction

(Dai and Mumper, 2010)

AIM

- ✓ Comparison of three different extraction methods in bay leaf extract in terms of phenolic content and antioxidant capacity;
  - ✓ Microwave assisted,
  - ✓ Enzyme-assisted,
  - ✓ Solvent extraction



MATERIALS AND METHODS

- ✓**Raw Material:** Dry bay leaf (*Laurus nobilis* L.)
- ✓**Methods:**
  - ✓Conventional (solvent) extraction
  - ✓Enzyme assisted extraction
  - ✓Microwave extraction

Conventional (Solvent) Extraction

- Solvent: 50% ethanol concentration
- Solid/solvent ratio: 1/10 (w/v)
- Extraction time: 24 hours

(Muniz-Marquez et al., 2018)

Enzyme Assisted Extraction

- Enzyme: Pectinex Ultra SP-L
- Dose: %8 (v/v)
- Extraction time: 30 min.
- Extraction medium pH: 5,5
- Extraction temperature: 45 ˚C

(Özkan and Bilek, 2015)

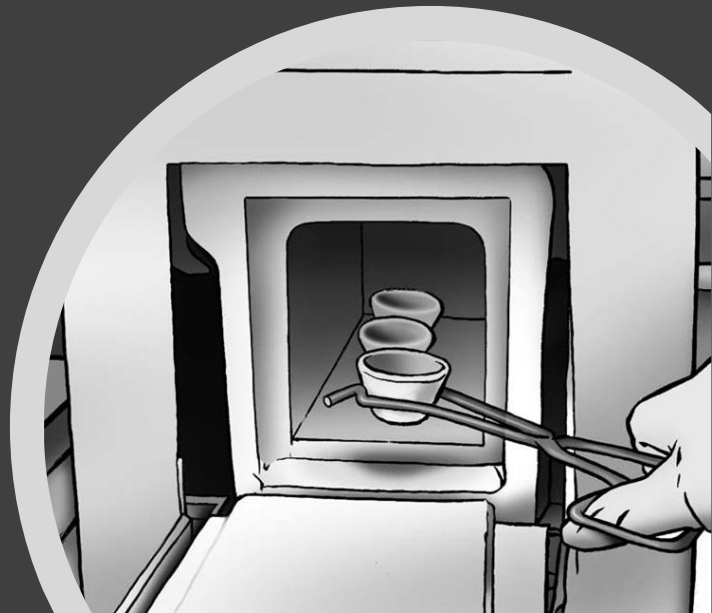
Microwave Assisted Extraction

- Power: 500 Watt
- Time: 30-60-90 s
- Solvent: 50% ethanol

(Zhang et al., 2019)

ANALYSES

- ✓Raw material analyses:
  - ✓Total dry matter (AOAC, 1990),
  - ✓Total ash (AOAC, 1990),
  - ✓Ascorbic acid (Bajaj and Kaur, 1981)
  - ✓pH value (Cemeroğlu, 2013)
  - ✓Titratable acidity (Cemeroğlu, 2013)
  - ✓Chlorophyll content (Vernon, 1960)
- ✓ Extract analyses:
  - ✓ Total phenolic content (Bilek, 2010)
  - ✓ DPPH radical scavenging activity (Garcia et al., 2012)



RESULTS AND DISCUSSIONS

✓ Table 1. Composition of dry bay leaf

Analysis	Result
Total dry matter (%)	95.39±0.39
Total ash (%) (D.M. basis)	3.67±0.33
Ascorbic acid (mg/100 g D.M.)	294.24±0.10
Chlorophyll (mg/100 g D.M.)	79.57±0.28
pH value (Dilution factor: 10% w/v):	5.35
Titratable acidity (g citric acid/100 g)	0.38

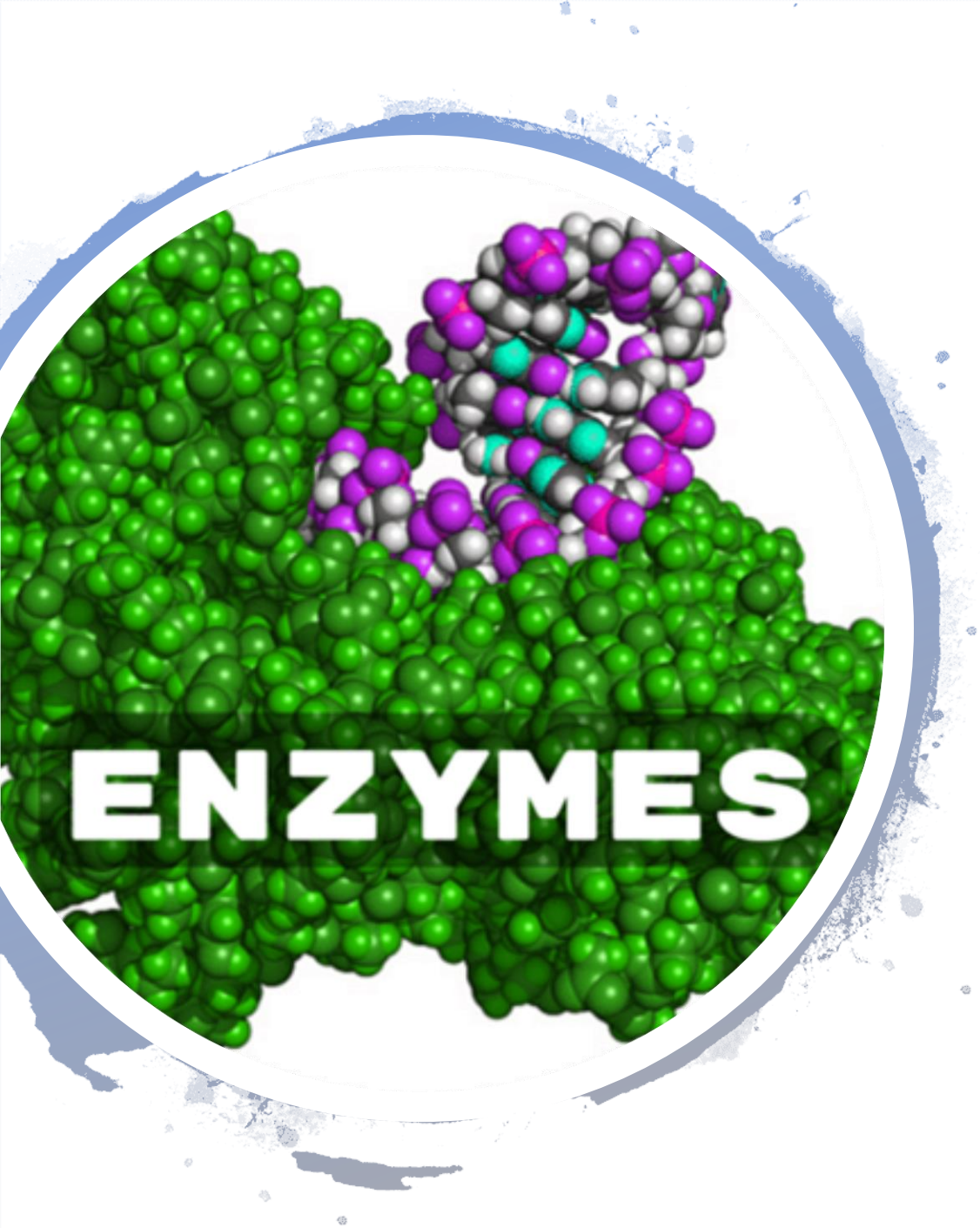
EXTRACT

Table 2: Total phenolic content and DPPH radical scavenging activity of bay leaf by different extraction techniques

	Solvent extraction	**Enzyme assisted ext.**	**Microwave assisted (30 s)**	**Microwave assisted (60 s)**
Total phenolic content	23.29±0.02 mg GAE/g	**32.45±0.02 mg GAE/g**	30.49±0.02 mg GAE/g	29.23±0.01 mg GAE/g
DPPH radical scavening activity	36.91%±0.05	**50.72%±0.27**	41.51%±0.09	38.03%±0.37

RESULTS AND DISCUSSIONS

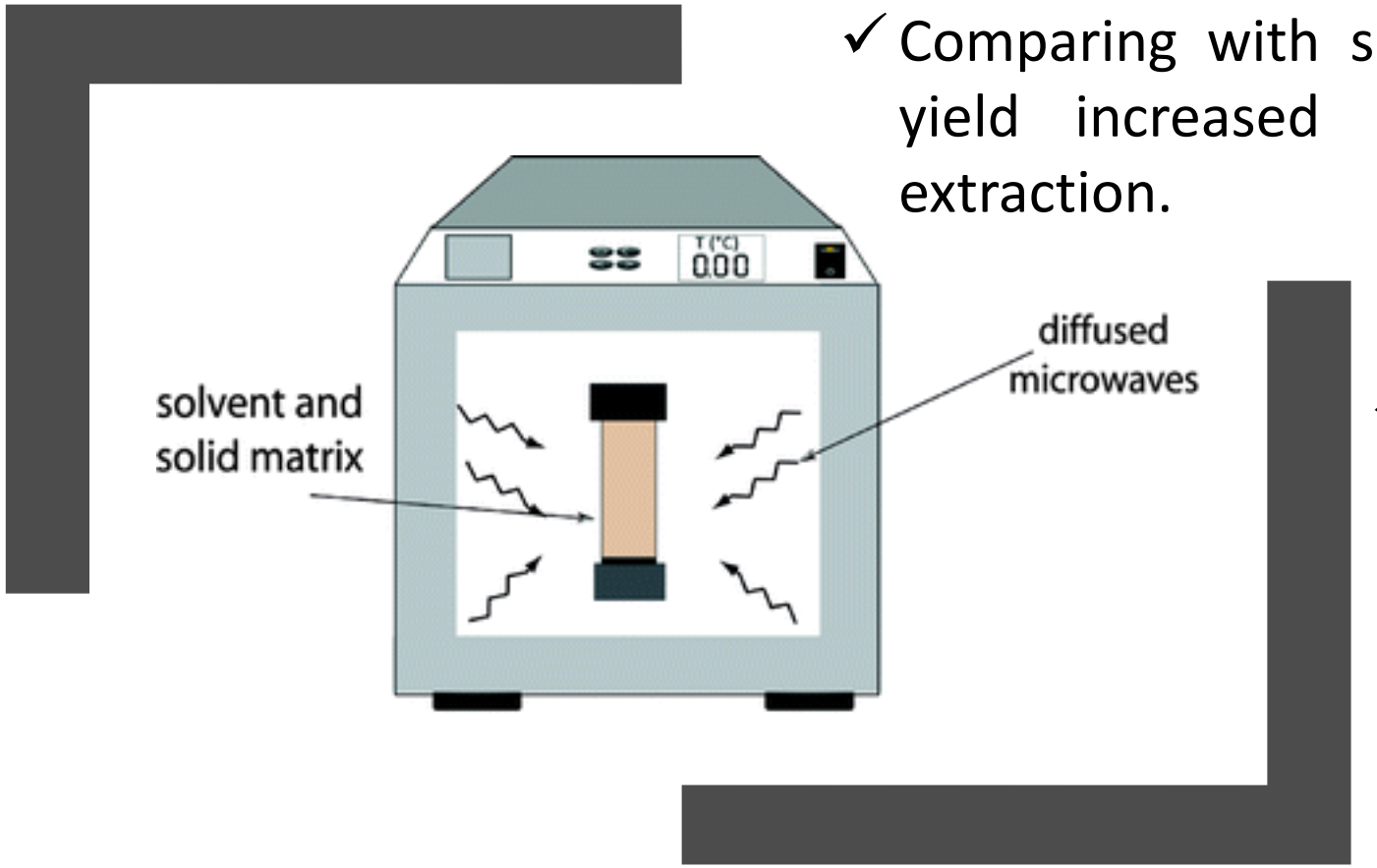
- ✓ In literature;
  - ❖ Total phenolic compounds: 12.0-84.5 mg GAE/g plant (Elmastaş et al., 2006; Muchuweti et al., 2007; Ouchikh et al., 2011; Albayrak et al., 2012)
  - ❖ DPPH radical scavening activity: 83.0-91.1% (Cherrat et al., 2014; El et al., 2014)



- ✓Looking at the total phenolic content and DPPH radical scavenging activity, it has seen that the best method is enzyme assisted extraction (TPC: 32.45 mg GAE/g plant).
- ✓This can be due to the Pectinex Ultra SP-L (Novozyme) disrupt the cell wall in the plant cell, facilitating the extraction of phenolic compounds (Boulila et al., 2015).
- ✓ Comparing with conventional extraction method, it was observed that the TPC extraction yield increased 39.29%.

- Poligalakturonase,
- Pectinesterase,
- Pectin trans eliminase
- Hemicellulase
- Cellulase

✓ After enzyme assisted extraction, it was seen that the microwave assisted extraction is also efficient for extraction of phenolic compounds.



✓ Comparing with solvent extraction, TPC extraction yield increased 30.87% in microwave assisted extraction.

✓ This can be due to in contrast to conventional heating, in microwave heating, for example, all are heated simultaneously, homogeneously and quickly.

(Yağcıoğlu, 2015)

- ✓The cells are heated by microwaves due to the moisture in them and as a result of evaporation, they apply pressure to the cell wall thus the cell wall disintegrates with this high pressure and the components can pass into the solvent.
- ✓However, the increase in extraction time in microwave assisted extraction may cause the degradation of bioactive compounds therefore the efficiency can decrease.

CONCLUSION

- The conventional extraction is not satisfactory in terms of extraction efficiency and time.
- The enzyme assisted extraction is the best way to increase the extraction efficiency based on the TPC and DPPH radical scavenging activity.
- In addition to enzyme assisted extraction, microwave assisted extraction can also be good solution in order to improve yield and energy saving.

CONCLUSION

- Extraction efficiency increased in both methods. Although the enzyme assisted extraction is better than microwave assisted extraction in terms of TPC yield, enzymes are expensive biological catalysts.
- In this case, optimization of parameters in both enzyme and microwave assisted extraction methods is important.

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THANK YOU