One Health
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# HERBICIDAL POTENTIAL OF SELECTED ESSENTIAL OILS AND MAIN COMPOUNDS AGAINST MODEL SPECIES OF WEEDS AND CROPS

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# Introduction

- Weeds are the main factor limiting agricultural productivity and can cause yield losses of up to 45%. Therefore, weed management is the most crucial crop protection technique

- Sadly, the increasing resistance of weeds to synthetic herbicides has necessitated exploring alternative, eco-friendly weed management strategies. Thus, the use of plant derived chemicals e.g. EOs as potential synthetic replacements is more and more important

- This experiment seeks to evaluate the phytotoxicity of oil-in-water (o/w) emulsions containing different proportions of carvone and limonene of natural origin in relation to seedlings of model crop - radish (Raphanus sativus)

# Materials

- Caraway Essential Oil (EO) was subjected to fractionation of the oil and analysis of its composition:
  - Fraction A: limonene (94%) and carvone (5%)
  - Fraction B: limonene (84%) and carvone (15%)
  - Fraction C: limonene (80%) and carvone (18%)
  - Fraction D: limonene (74%) and carvone (25%)
  - Fraction E: limonene (53%) and carvone (46%)
  - Fraction F: limonene (3%) and carvone (96%)
  - Fraction G: limonene (0.1%) and carvone (99%)
- The oil in water (o/w) nanoemulsions included various fractions (A-G) derived from the essential oil of caraway (Carum carvi L.)

# Methodology

- Concentrations of I- 0.1%, II- 0.05% and III - 0.001% were selected for each fraction
- The control treatment was composed of water only
- A Petri dish (11 cm ⌀) experiment was carried out in glass dishes, replicated thrice
- Two sterile filter paper rings were placed in each petri dish and soaked with 5 mL of an appropriate o/w solution of EO (Fraction A-G)
- Thirty seedlings (pre-germinated) of the tested species were placed on two layers of sterile filter paper in each dish
- The seedlings were allowed to grow for seven days in the dark at room temperature (±25 °C)
- The seedlings were counted, and the lengths (cm) of their roots and shoots were measured

# Results and discussions

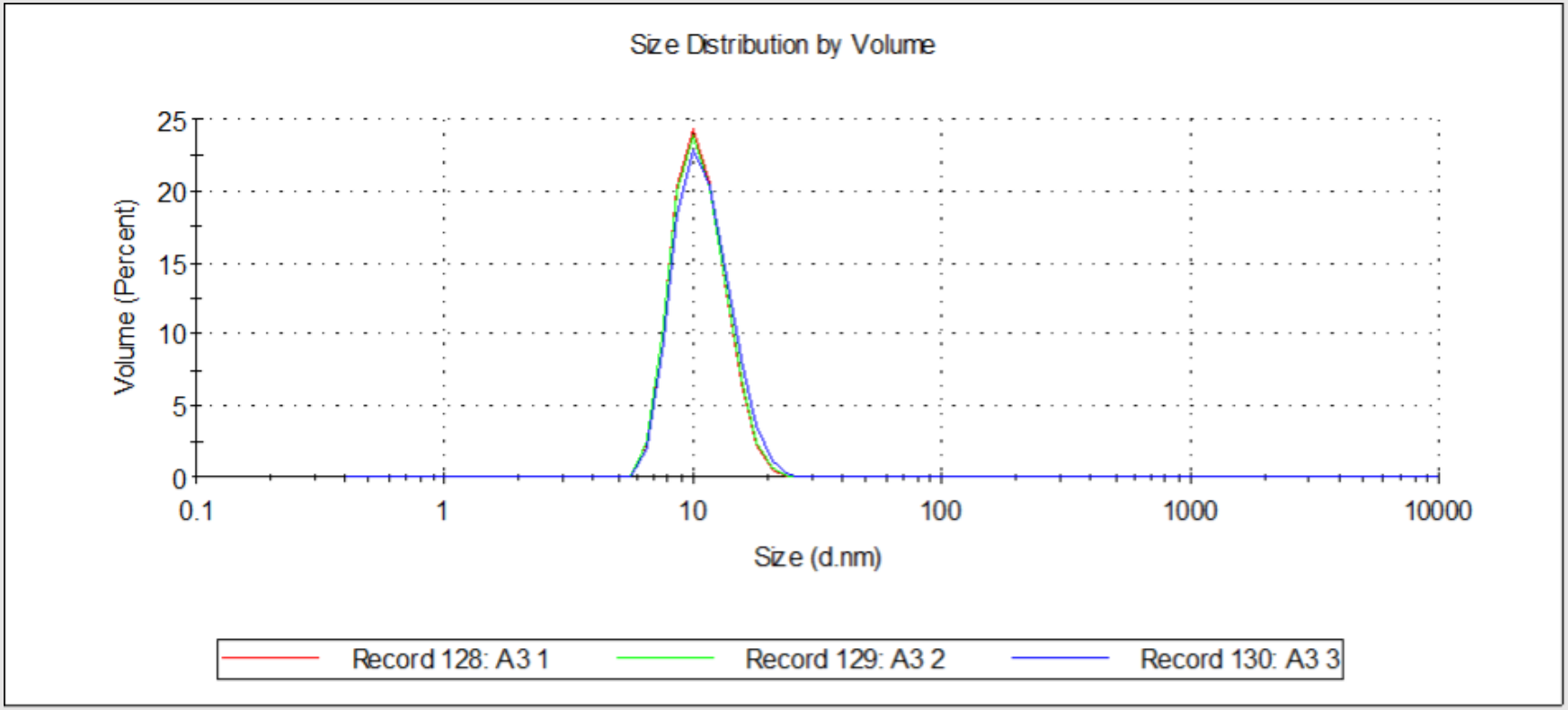


**Figure 1:** Droplet sizes of the nanoemulsion A3

The average droplet size was used to determine the rheological properties of the obtained preparations.

# Results and discussions


**Figure 2:** Seedlings after seven days growth in the dark at room temperature (±25 °C), treatment F.

# Results and discussions

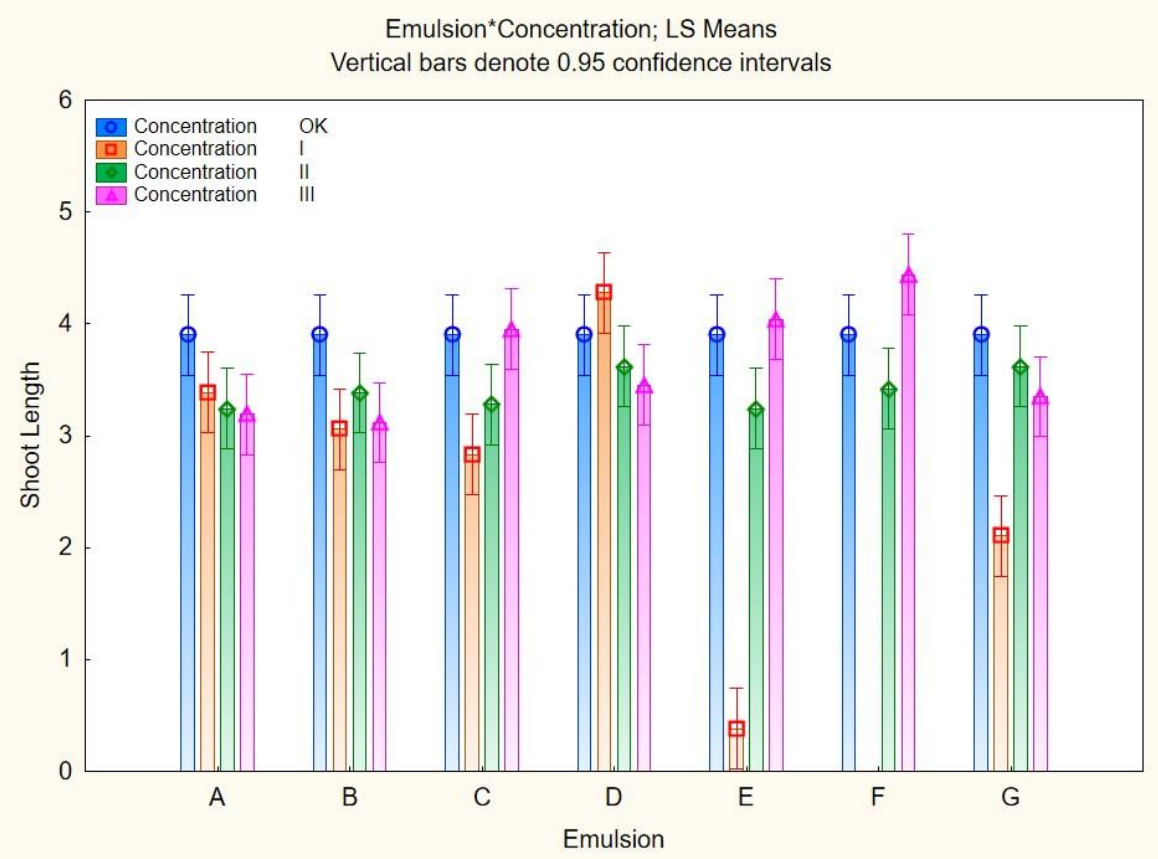


**Figure 3:** Response of Radish shoots to different concentration of caraway oil (mean value ± standard error)

0K – control (water only), Concentration I – 0.1%, Concentration II – 0.05%, Concentration III - 0.001%.

# Results and discussions

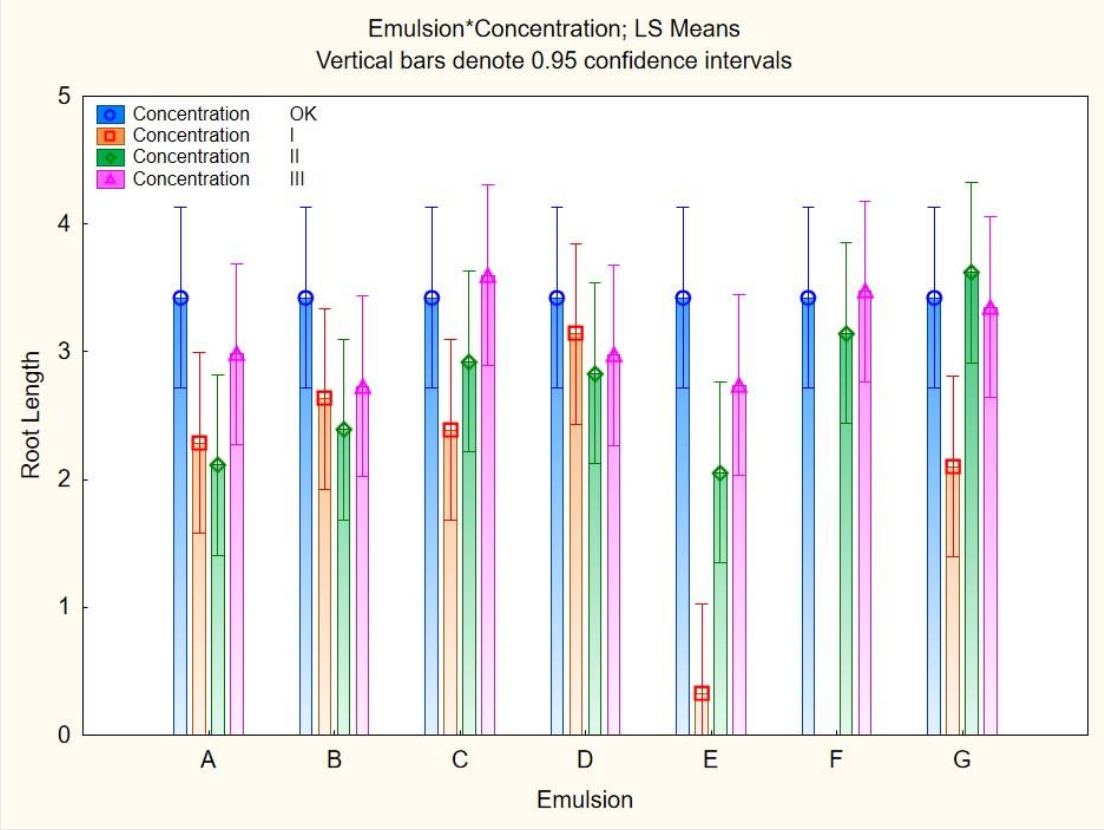


**Figure 4:** Response of Radish roots to different concentration of caraway oil (mean value ± standard error)

0K – control (water only), Concentration I – 0.1%, Concentration II – 0.05%, Concentration III - 0.001%.

# Conclusions and Recommendations

- Under laboratory conditions and at the concentrations tested, limonene significantly inhibited the germination and growth of radish seedlings
- At higher concentrations in nano emulsions, seedling death was observed
- These findings highlight the potential selective properties of d-limonene, warranting further investigation

# References

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# Thank you for your attention!

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