



WASABI-SUBSTITUTE CONDIMENT WITH ANTI-CANCER POTENTIAL FROM MICROGREEN-STAGE MUSTARD GREENS



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INTRODUCTION & RATIONALE

IN THAILAND, A LOCAL MUSTARD GREEN KNOWN AS "PAK KAD KIAO NOI" (*BRASSICA JUNCEA*) PRESENTS A PROMISING SUBSTITUTE.

ITS PUNGENT, WASABI-LIKE AROMA ORIGINATES FROM COMPOUNDS SUCH AS ALLYL ISOTHIOCYANATE AND 3-BUTENYL ISOTHIOCYANATE,

WHICH RESEARCH INDICATES ALSO POSSESS POTENT ANTI-CANCER PROPERTIES AGAINST BREAST, LIVER, AND COLON CANCER CELLS. (MATRA, K.(2022)

WHEN GROWN IN ITS MICROGREEN STAGE, PAK KAD KIAO NOI RETAINS HIGH LEVELS OF THESE BENEFICIAL BIOACTIVE COMPONENTS, INCLUDING GLUCOSINOLATES THAT CONVERT INTO ISOTHIOCYANATES UNDER THE ACTION OF MYROSINASE ENZYME.

WHY IT MATTER:

MUSTARD GREEN AKA 'PAK KAD KIAO NOI' MICROGREENS HARVESTED AT 21 DAYS REPRESENT A LOCALLY GROWN ALTERNATIVE TO TRADITIONAL WASABI, WHICH TYPICALLY REQUIRES 2-3 YEARS TO CULTIVATE.

IN THE SAME TIMEFRAME, CAN PRODUCE UP TO 21-35 TIMES MORE MICROGREENS COMPARED TO WASABI PLANTS, MAKING THEM A SCALABLE, COST-EFFECTIVE OPTION FOR BOTH SMALLHOLDER AND COMMERCIAL ENTERPRISES.

RESULTS

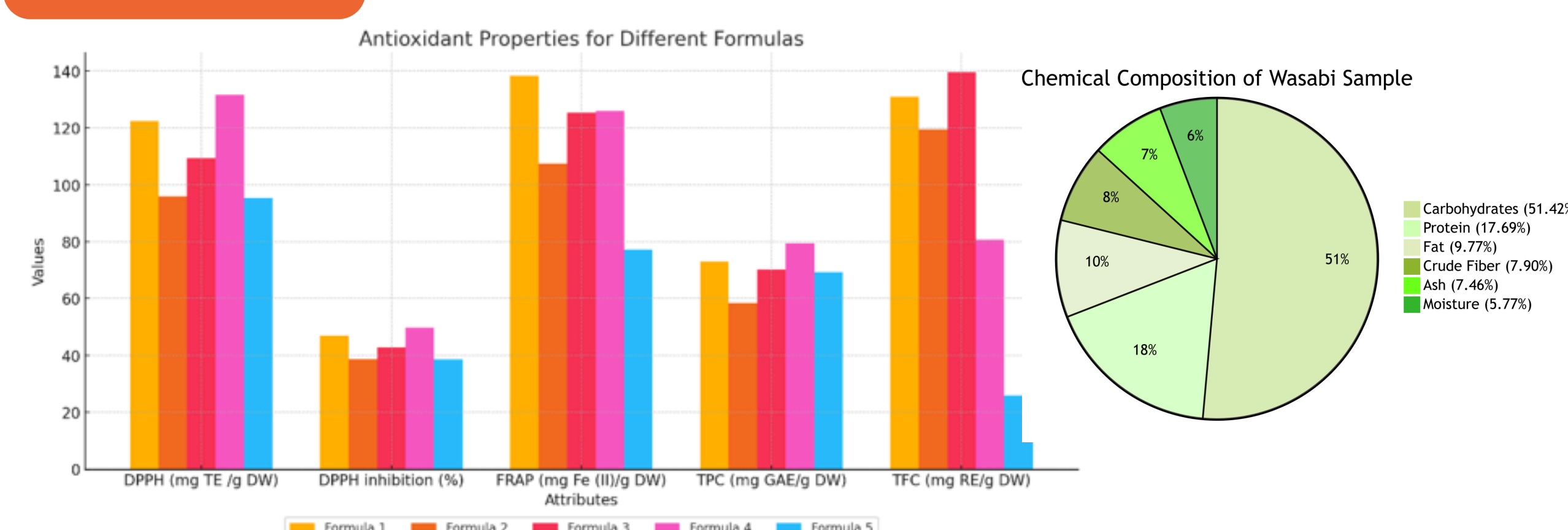
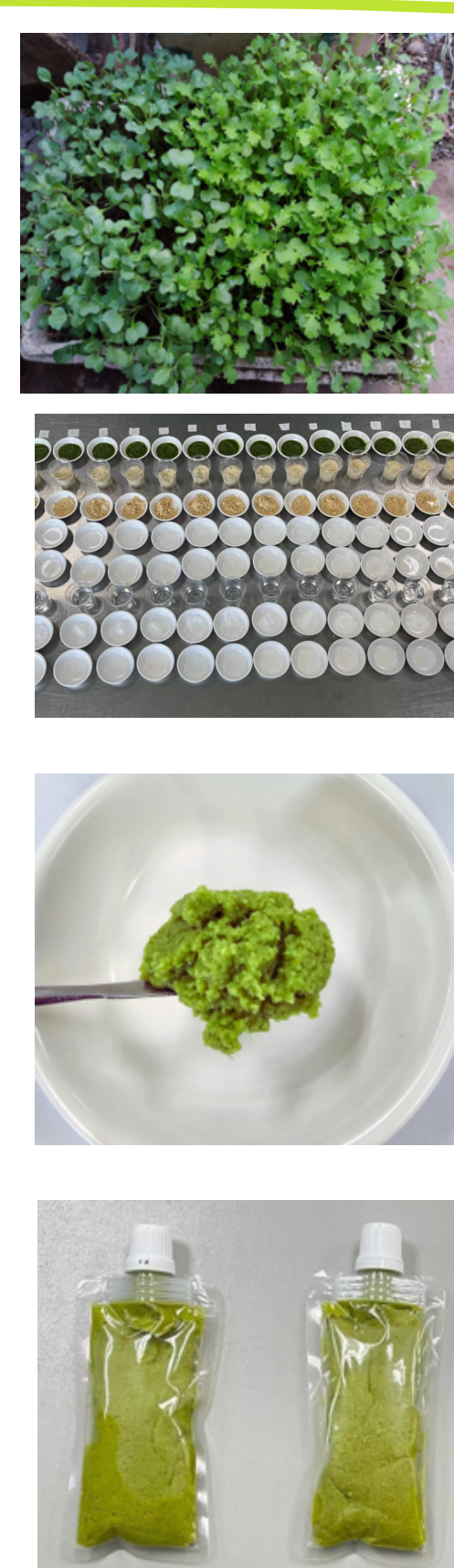


FIG.1 ANTIOXIDANT PROPERTIES AND PROXIMATE COMPOSITIONS

- THE NEWLY DEVELOPED FORMULA (4) DEMONSTRATED DPPH RADICAL SCAVENGING ACTIVITY OF 131.69 MG TE/G DW, WITH A 49.76% DPPH INHIBITION RATE—SURPASSING STANDARD BENCHMARKS.
- HIGHLIGHTS ITS CONSIDERABLE PROTEIN CONTENT (17.69%), MODERATE FAT (9.77%), BENEFICIAL FIBER (7.90%), AND ESSENTIAL MINERAL PRESENCE (7.46% ASH).
- THE LOW MOISTURE LEVEL (5.77%) CONTRIBUTES TO EXTENDED SHELF LIFE AND PRESERVES VITAL BIOACTIVE SUBSTANCES
- USES MILD PASTEURIZATION POST-PACKAGING FOR UP TO 90 DAYS OF SHELF LIFE, MAKING IT COMMERCIAL VIAL.

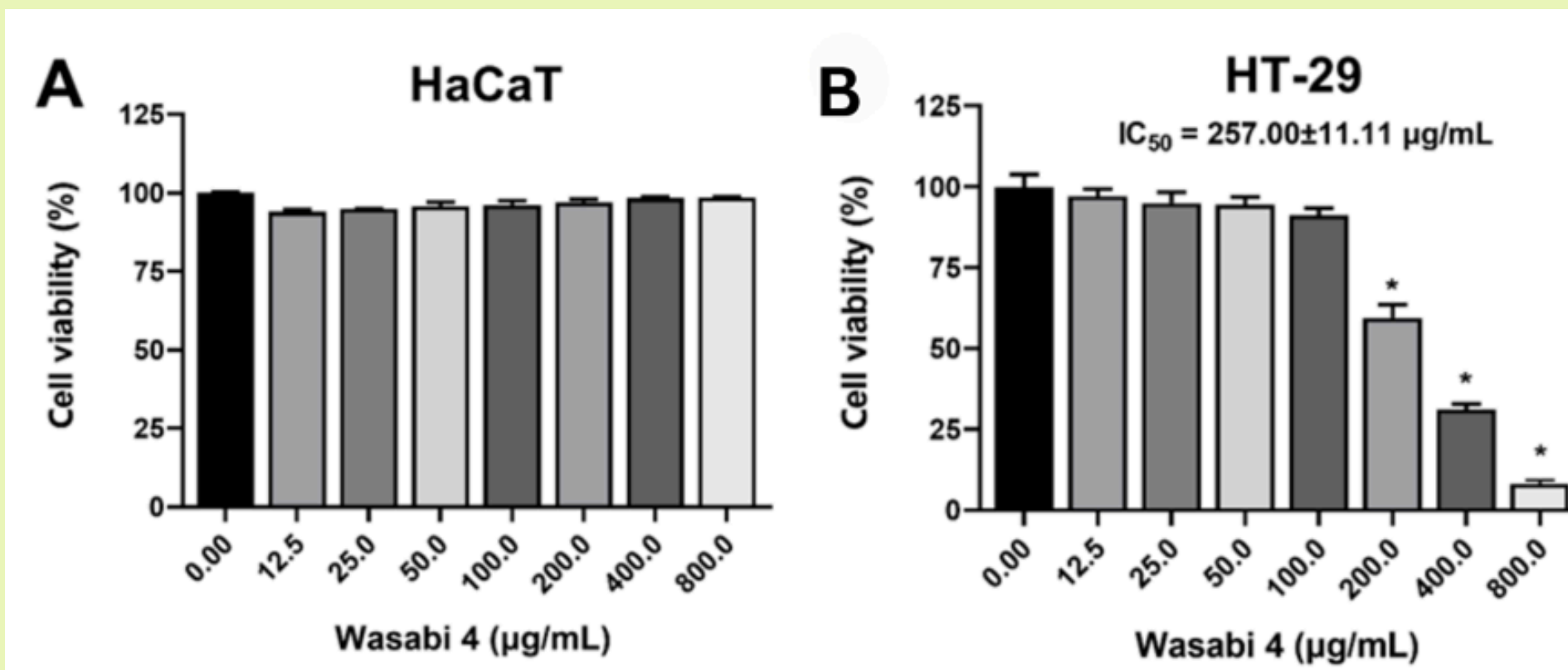
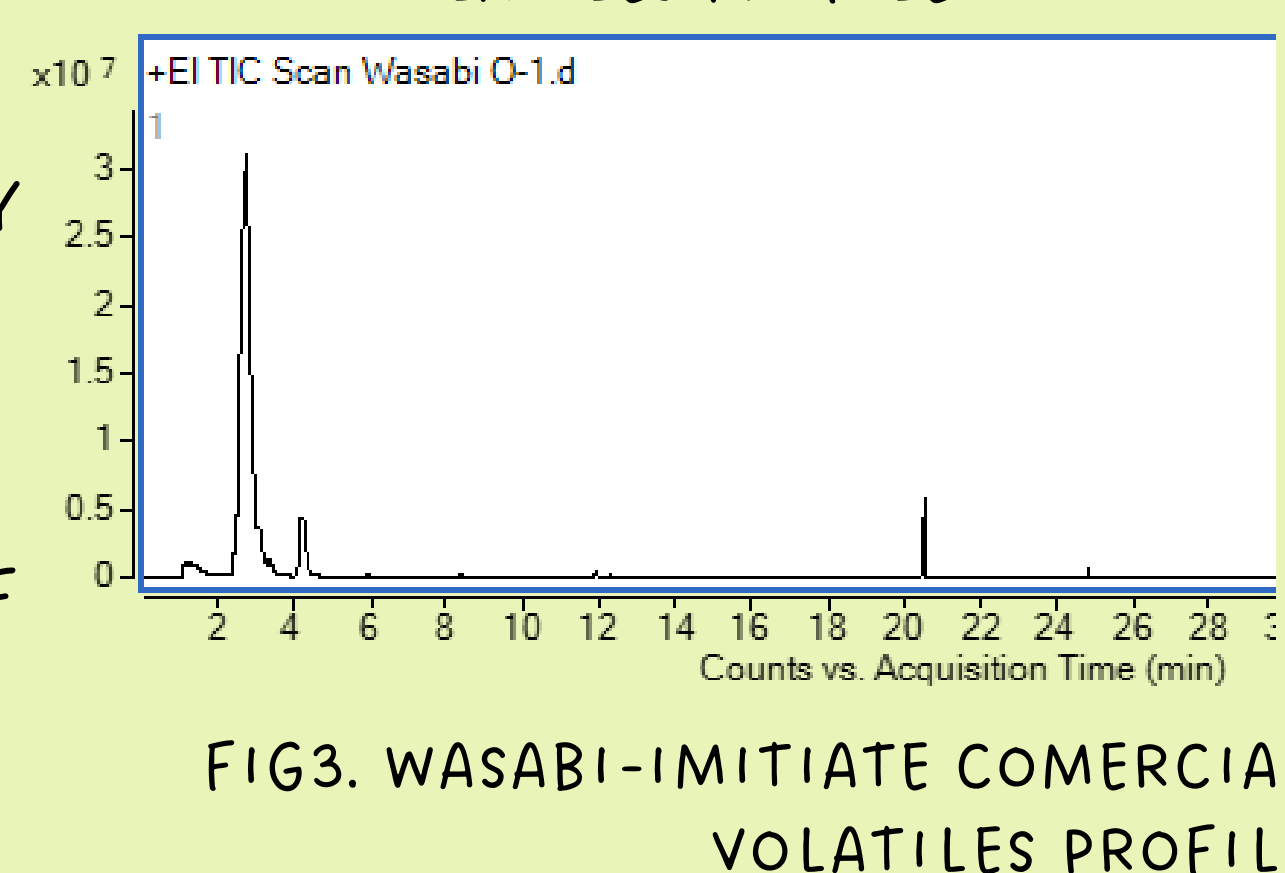
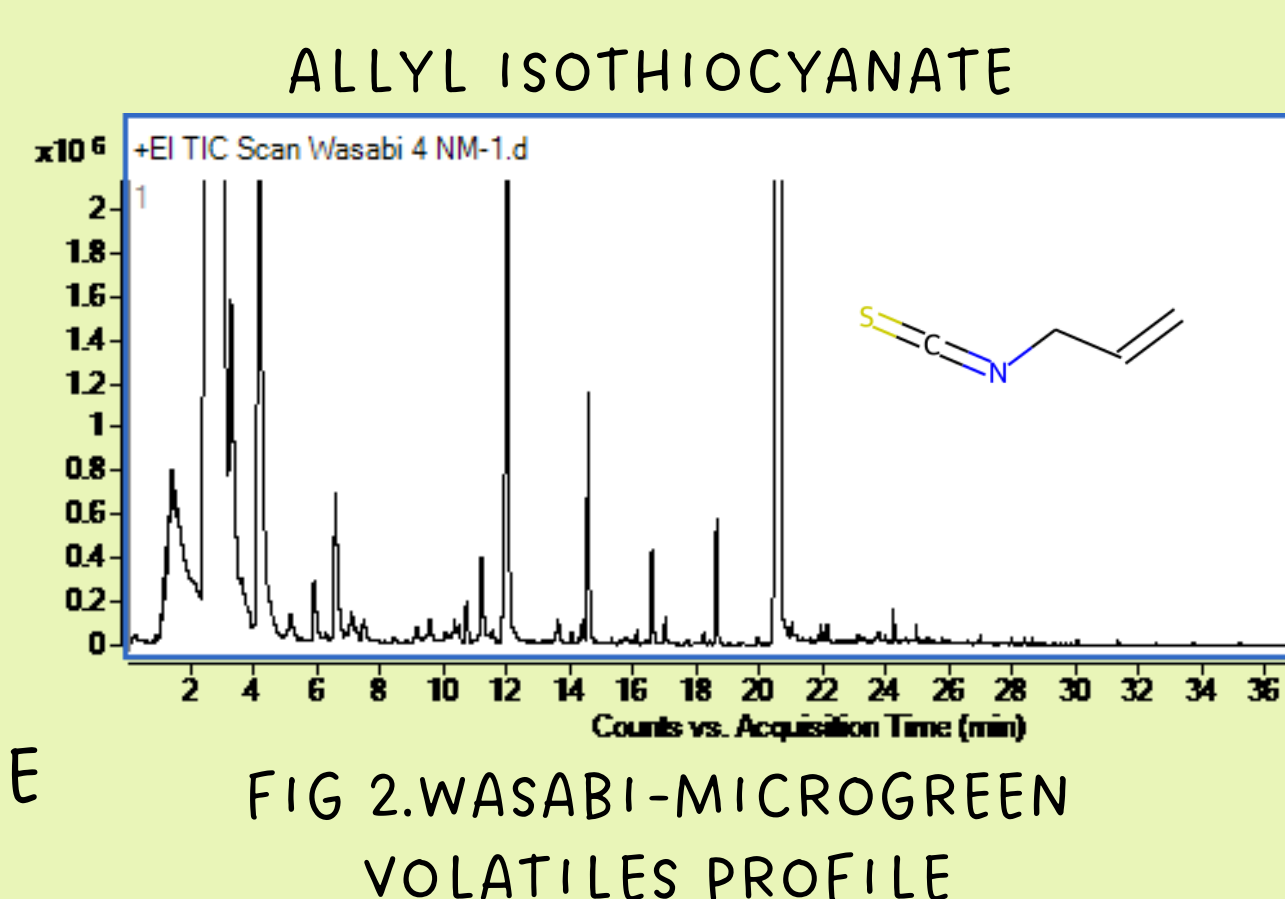
METHODOLOGY

- DEVELOP A MICROGREEN-BASED CONDIMENT REPLICATING WASABI'S PUNGENCY.
- MICROGREEN CULTIVATION (21 DAYS)
- EXTRACTION & FORMULATIONS MIXTURE DESIGN
- MAXIMIZE BIOACTIVE COMPOUNDS AND SENSORY ACCEPTABILITY (ECMSU 654-531/2024). FROM 13 FORMULAR SCREEN TO 4 FORMULA
- EVALUATE ANTI-CANCER ACTIVITY CANCER CELL LINE: HT-29 HUMAN COLON CARCINOMA CELLS
- NORMAL CELL LINE: HACAT HUMAN KERATINOCYTE CELLS (CONTROL) (ATCC, MANASSAS, VA, USA).
- SHELF LIFE STUDY AT REFRIGERATED AND COST FEASIBILITY.



INNOVATION HIGHLIGHTS

- STRONG RADICAL SCAVENGING ACTIVITY
- HIGH BIOACTIVITY & ANTI-CANCER PROPERTIES
- POTENT ISOTHIOCYANATES: CONTAINS 0.13 MMOL/100 G DW OF ISOTHIOCYANATES, NOTABLY ALLYL ISOTHIOCYANATE, EXCEEDING THE CONCENTRATION FOUND IN A COMMERCIAL WASABI-LIKE PRODUCT (0.02 MMOL/100 G DW).
- ANALYSIS REVEALED 32 DISTINCT VOLATILE COMPOUNDS—PRIMARILY ALLYL ISOTHIOCYANATE, BUT ALSO CARVONE (4.15%), B-CARYOPHYLLENE (0.32%), AND 4-ETHYL-5-METHYLTHIAZOLE (0.62%).
- THESE COMPOUNDS NOT ONLY MIMIC THE PUNGENCY AND AROMA OF TRUE WASABI BUT MAY ALSO ENHANCE ANTIOXIDANT AND ANTI-INFLAMMATORY POTENTIAL.



- MODERATE CYTOTOXICITY ON CANCER CELLS ($IC_{50} \sim 257$ MG/ML): EXHIBITS A TARGETED EFFECT AGAINST HT-29 COLON CANCER CELLS,
- LOW TOXICITY ON NORMAL CELLS (HACAT), EMPHASIZING SAFETY FOR NON-CANCEROUS TISSUE.

OUTCOMES

- LOCAL AGRICULTURE & SUSTAINABILITY: BOOSTS LOCAL FARMING BY LEVERAGING THAI MUSTARD GREENS.
- CONSUMER HEALTH & WELLNESS: FUNCTIONAL FOOD POTENTIAL.
- COST-EFFECTIVENESS: ESTIMATED PRODUCTION COST OF 1.0 THB/G. FAR LOWER THAN TRADITIONAL WASABI IMPORT COSTS.
- MARKET-READY INNOVATION: HIGH SENSORY ACCEPTANCE AND CONFIRMED PROCESS STABILITY UNDERScore READINESS FOR COMMERCIAL LAUNCH UPON RECEIVING RELEVANT FOOD SAFETY CERTIFICATIONS.
- PRETTY PATENT APPLICATION NUMBER: TH232403004234 DATE 18 DEC2024 PROCESS AND FORMULATION OF WASABI-SUBSTITUTE CONDIMENT WITH ANTI-CANCER FROM MICROGREEN-STAGE MUSTARD GREENS

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