

# **ANTIMICROBIAL PROPERTIES OF SOME PLANT EXTRACTS ON ORGANISMS ASSOCIATED WITH FISH SPOILAGE**

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# OVERVIEW

- **Brief on OAPTIN**
- **Basic Principles of Aquaculture Production**
- **Organic Principles of production**
- **Fish Insecurity in Africa**
- **Need to adopt OA principles for Fish Production in Africa**
- **Potential of Plant Extracts as Antimicrobial agents in Organic fish production.**

**Black pepper (*Piper guineense*)**

**Grape (*Citrus paradisa*)**

**Pawpaw (*Carica papaya*)**

# ORGANIC AGRICULTURE PROJECT IN TERTIARY INSTITUTIONS IN NIGERIA (OAPTIN)

- **Formed in 2004 with a mandate for training, research and development of OA.**
- **Members include tertiary Institutions, Research Institutes and individuals with interest in OA .**
- **University of Agriculture, Abeokuta, UNAAB**  
**Working group members with expertise in: Agronomy, Food Science & Technology, Horticulture, Agricultural Economics, Crop protection Microbiology, Environmental Management & Toxicology, Aquaculture & Fisheries Management, Forestry and Wildlife Management, Botany, etc.**

# **BASIC PRINCIPLES OF AQUACULTURE PRODUCTION**

- **FAO defines aquaculture as the farming of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated.**
- **IFOAM (2008), OA production strives to sustain the health of soils, the ecosystem and is generally stakeholder - friendly. Organic production relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic Agriculture combines tradition, innovation and science to benefit the shared environment and promotes fair relationships and a good quality of life for all involved.**
- **Thus, Organic aquaculture can be defined as a production system that sustains the health of the aquatic ecosystem, and relies on its biodiversity and cycles while giving due regard to local conditions and traditions.**

# PROBLEMS OF CONVENTIONAL AQUACULTURE

- **While aquaculture remains the fastest growing food production sector globally, supplying over 47 percent of total food fish demand (FAO, 2009), the industry faces several challenges including:**
- **Pollution: uneaten food, drugs and chemicals remain in the aquatic ecosystem, causing pollution and water quality degradation.**
- **Large quantities of pelagic fish (anchovies, mackerel, menhaden and herrings) and oil obtained from capture fisheries are incorporated into aquaculture feeds to sustain the culture of carnivorous species (e.g. salmon). It is estimated that about 3kg fish is required per kg of these species. This causes overexploitation and food shortages.**
- **Farmed fish sometimes pose threats to wild fish populations by competing with them for food and habitat and also transmitting diseases and parasites e.g. sea lice on salmon smolts, outbreak of infectious hematopoietic necrosis in salmon farms in Canada.**
  - **Titanic fish (a 43.6 pound Rainbow trout caught in Lake Diefenbaker, south Saskatchewan, Canada)**
  - **Lake Victoria (the Kenyan experience)**

# **FISH INSECURITY IN SUB-SAHARAN AFRICA (SSA)**

- **Per capita fish consumption is reducing in SSA (9kg in 1990 to a present level of 6kg) compared to other regions of the world because of:**
  - **Low production**
  - **High post-harvest loss (25-50% in some cases!)**
  - **Optimal use of available resources has been curtailed by poor infrastructure and lack of production inputs**
- **Production in capture fisheries has leveled off globally and is not likely to increase beyond current levels.**
- **FAO (2009) encourages increased investments in aquaculture production however this has provoked a fierce backlash from the environmental community**

# **ORGANIC AQUACULTURE TO THE RESCUE?**

- **Africa has a rich biodiversity of fish, particularly Tilapia species, catfishes, mullets and others.**
- **Studies indicate that feedstuffs and agricultural wastes abound in quantities that support commercial production of Tilapia and catfishes with two or more cycles/y in many African countries.**
- **Aquaculture is relatively new in Africa & estimated to be 95% small scale with fish ponds integrated into the mosaic of farm activities.**

# INPUTS FOR ORGANIC FISH PRODUCTION

- **Fish seed**
  - Collection from the wild**
  - Natural production protocols**
  - Natural spawning materials**
- **Organic feeds/feeding protocols**
  - Manuring, composting (agricultural & domestic wastes)**
  - Use of natural feeds (phytoplankton, zooplankton, maggots, worms etc)**
- **Antibiotics, preservatives, antioxidants, etc**
- **Other inputs**

# PLANT MATERIALS EVALUATED FOR ANTIMICROBIAL PROPERTIES

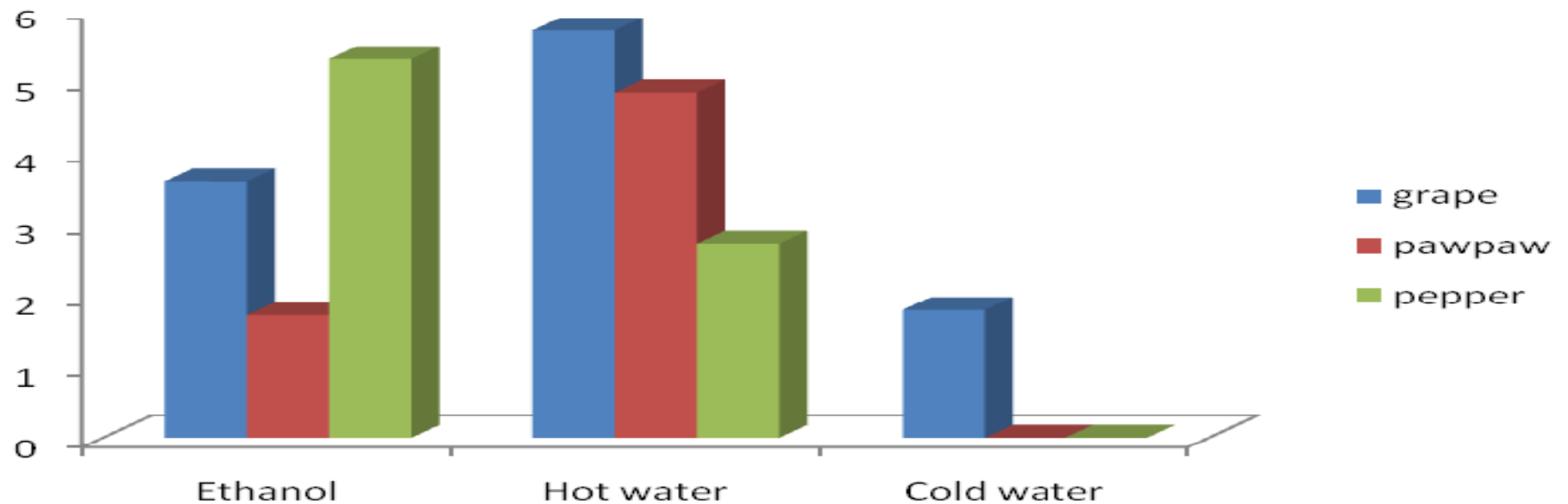
- **Black pepper (*Piper guineense*)**
- **Grape (*Citrus paradisa*)**
- **Pawpaw (*Carica papaya*)**

# MICROORGANISMS ASSOCIATED WITH FISH SPOILAGE

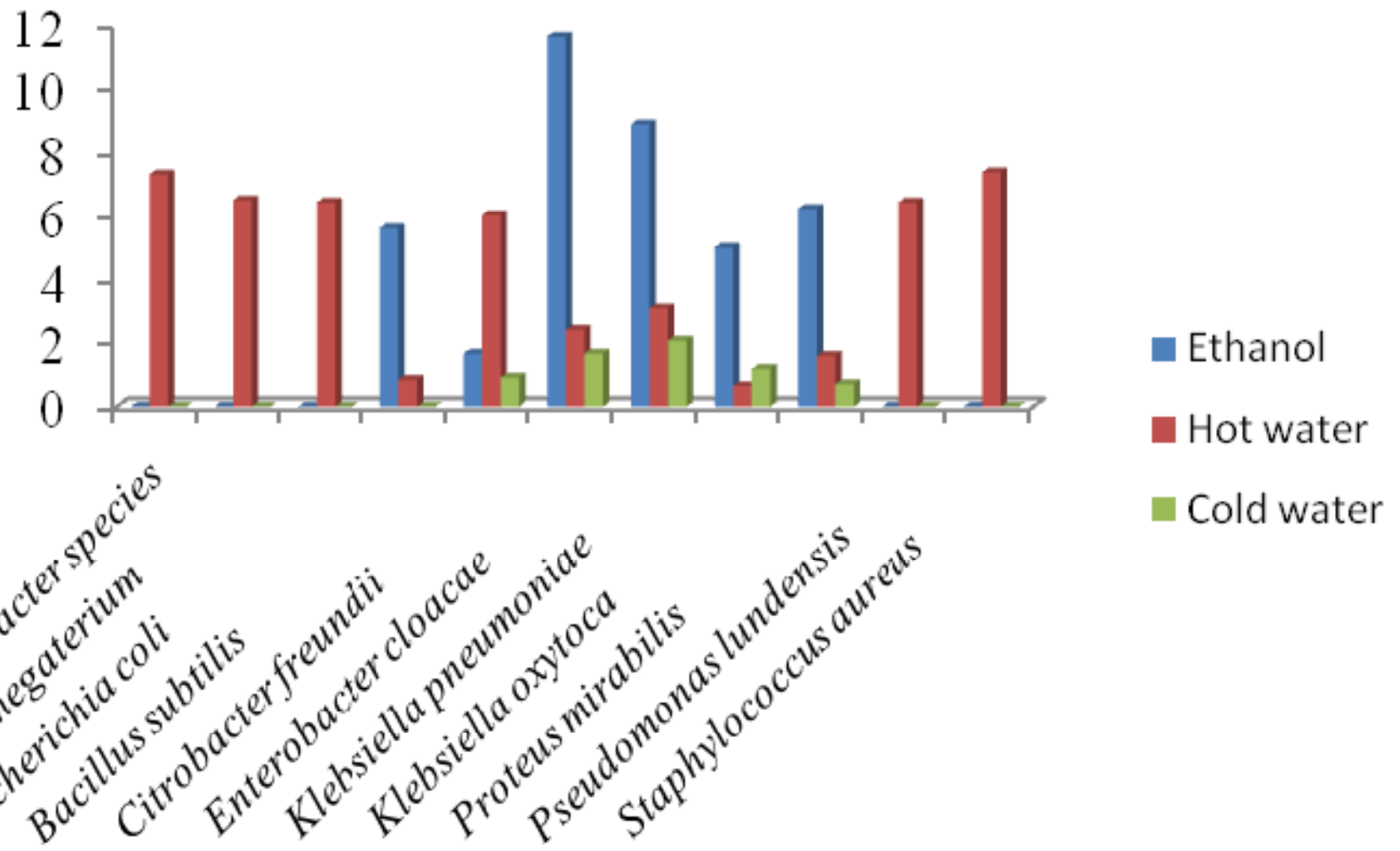
- ***Acinetobacter species***
- ***Bacillus megaterium***
- ***Bacillus subtilis***
- ***Citrobacter freundii***
- ***Enterobacter cloacae***
- ***Escherichia coli***
- ***Klebsiella oxytoca***
- ***Klebsiella pneumoniae***
- ***Pseudomonas lundensis***
- ***Pseudomonas mirabilis***
- ***Staphylococcus aureus***

# TESTS

- EFFECTS OF EXTRACTION METHOD ON ANTIMICROBIAL ACTIVITIES OF PLANTS EXTRACTS**



# EFFECTS OF EXTRACTION METHOD ON ISOLATED MICROORGANISMS



# ON THE SENSITIVITY OF MICROORGANISMS

- **Conc. (g/ml)      Mean Zone of Inhibition (mm)**
- **0.1                       $1.74 \pm 0.35c$**
- **0.2                       $2.44 \pm 0.43b\ c$**
- **0.3                       $2.86 \pm 0.45\ a\ b\ c$**
- **0.4                       $3.34 \pm 0.51\ a\ b$**
- **0.5                       $3.90 \pm 0.65\ a$**
- **Means with the same letter are not significantly different**

# DISCUSSION

- **Extracts evaluated had antimicrobial effects against spoilage organisms associated with spoilage of fresh *Clarias gariepinus***
- **Efficacy of extracts was dependent on source, concentration and solvent used in extraction.**

# CONCLUSIONS


- **Plant extracts have high potential as natural/organic antimicrobials and may find use as preservatives and antioxidants in organic fish production.**





**THANK YOU!**

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