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INTERCROPPING OF FINGER MILLET AND MOONG BEAN FOR AGRONOMICAL, NUTRITIONAL, AND MOLECULAR INTERVENTIONS

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Abstract:

This the study seeks to explore the potential of intercropping finger millet (*Eleusine coracana*) and moong (*Vigna radiata*) as a strategy to enhance agricultural productivity while providing nutritional benefits and understanding molecular interactions. The focus is on optimizing agronomic efficiency, improving nutritional outcomes, and revealing the molecular pathways involved in intercropping these two crops. Given the global challenges of food security and soil degradation, this study aims to develop sustainable, high-yielding, and nutritionally rich cropping systems that combine ancient grains and legumes in a complementary system. Field experiments, laboratory-based nutritional assays, and molecular biology techniques will be employed to evaluate the agronomical, nutritional, and genetic impacts of this intercropping system.

Introduction

In the face of increasing population and environmental pressures, the demand for sustainable and nutritionally rich agricultural systems has never been greater. Finger millet is an ancient crop known for its drought tolerance and high nutritional value, particularly its calcium and fibre content. Moong, a legume rich in protein, complements cereal crops in traditional cropping systems due to its ability to fix atmospheric nitrogen and improve soil fertility. Despite the promise of both crops, their combined potential in intercropping systems remains underexplored, especially in terms of agronomical optimization, nutritional improvements, and molecular mechanisms.

Research Problem:

Current monoculture cropping systems can deplete soil nutrients, increase vulnerability to pests, and require high inputs of water and fertilizers. Intercropping, where two or more crops are grown together, offers a possible solution by increasing biodiversity, enhancing soil health, and improving yield. However, while cereal-legume intercropping has been explored for major crops, research on finger millet and moong intercropping is still sparse, particularly concerning their molecular interactions and potential for biofortification.

Significance of the Research:

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This research will fill the gap in understanding the benefits of intercropping finger millet and moong by providing both empirical agronomic data and nutritional analysis, while also investigating the molecular basis of the interactions between these crops. The outcomes will contribute to sustainable agricultural practices, benefiting smallholder farmers in semi-arid regions while addressing global nutritional needs.

Cultivation and Production of Finger Millet and Moong

Finger Millet (*Eleusine coracana*)

1. **Climate and Soil Requirements**:
    - Thrives in warm, semi-arid climates.
    - Grows well in loamy, sandy, and black soils with a pH of 5-7.
2. **Sowing and Seed Rate**:
    - Sown during the monsoon season (June-August).
    - Requires 8-10 kg of seeds per hectare, spaced 30 cm apart.
3. **Irrigation**:
    - Primarily rainfed, but supplemental irrigation is beneficial during flowering and grain-filling stages.
4. **Fertilization**:
    - Organic manure (10-12 tons/ha) and chemical fertilizers (40-60 kg/ha nitrogen, 30-40 kg/ha phosphorus).
5. **Weed and Pest Control**:
    - Hand or mechanical weeding at 15-20 and 30-35 days after sowing. Minimal pest issues but susceptible to blast disease.
6. **Harvesting and Yield**:
    - Harvested after 100-120 days. Yield is 1.5-2.5 tons/ha under rainfed conditions, up to 3-4 tons/ha with irrigation.

Moong (*Vigna radiata*)

1. **Climate and Soil Requirements**:
    - Grows in warm climates (25-35°C) with light to moderate rainfall.
    - Best in sandy loam to clay loam soils with a pH of 6-7.5.
2. **Sowing and Seed Rate**:
    - Sown in the Kharif season (June-July) or spring.
    - Requires 15-20 kg of seeds per hectare, spaced 30-45 cm apart.
3. **Irrigation**:

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- Requires 2-3 irrigations depending on rainfall. Critical irrigation stages are flowering and pod development.

4. **Fertilization**:
   - Requires 20-25 kg nitrogen, 40-50 kg phosphorus, and organic manure (5-10 tons/ha).
5. **Weed and Pest Control**:
   - Requires 1-2 weedings or herbicide use. Pests like aphids and pod borers are common, but manageable.
6. **Harvesting and Yield**:
   - Harvested after 60-75 days. Average yields range from 0.8-1.5 tons/ha.

Intercropping of Finger Millet and Moong

Intercropping finger millet (*Eleusine coracana*) and moong (*Vigna radiata*) is an effective strategy to enhance crop productivity, soil health, and nutritional value. This system optimizes the use of resources, as finger millet's deep roots access nutrients and water from lower soil layers, while moong's shallow roots utilize the upper layers. Moong also enriches the soil by fixing nitrogen, benefiting finger millet and reducing the need for synthetic fertilizers.

Nutritionally, finger millet is rich in calcium, fibre, and iron, while moong is high in protein, vitamins, and minerals. Intercropping them provides a more balanced and nutrient-dense harvest, making it ideal for regions facing malnutrition. Environmentally, the system improves water use efficiency, reduces pest and weed pressure, and supports biodiversity. It also enhances land-use efficiency, leading to higher yields and better economic outcomes for farmers. However, careful crop management and synchronization of planting and harvesting are essential for maximizing benefits. This intercropping system offers a sustainable approach to improving both food security and environmental resilience, particularly in semi-arid regions.

Experimental Design:

The seeds of indigenous variety of Ragi collected from Krishi Vigyan Kendra- Papumpare. The research will be conducted through a series of field experiments using a randomized complete block design (RCBD) with three treatments: monoculture of finger millet, monoculture of moong, and intercropping of finger millet and moong. Each treatment will be replicated across five blocks to ensure statistical accuracy. The data on different parameters of agronomical, nutritional and molecular will be harvested under different treatments of biofertilizers at different time interval.

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Reference:

Kumar, B., Singh, M., Kumar, A., & Kumar, D. (2024). Finger millet scientific cultivation and its uses in India. In *Millets: Rediscover Ancient Grains. IntechOpen.*

Chaudhary, M., Mandal, A., & Muduli, S. (2022). Agronomic biofortification of food crops: A sustainable way to boost nutritional security. In *Revisiting Plant Nutrition for Sustainable Crop Production*. IntechOpen.

Kumar, A., Kadam, S., Arif, M., & Meena, R. (2020). Legumes: An alternative land use option for sustaining soil health. *Agriculture & Food e-Series*.

Layek, J., Das, A., Mitran, T., & Nath, C. (2018). Cereal-legume intercropping: An option for improving productivity and sustaining soil health. In *Legumes for Soil Health and Sustainable Management.* Springer.