Combating Kwashiorkor: Replenishing the Tryptophan in Sanambele, Mali

Kathryn Gause
Department of Plant Sciences and Plant Pathology, Montana State University, Bozeman, MT 59717
PSP 465R Health, Poverty, Agriculture: Concepts and Action Research, Spring 2011

Introduction

- Kwashiorkor is a problem in many material resource-poor countries where foods containing “complete proteins” are scarce.
- Coined as “what happens to the baby when a new baby comes” in the 1930s, kwashiorkor affects young children most when weaned off mothers breast milk.
- Kwashiorkor is a form of malnutrition where child receives adequate caloric intake but amino acids are not present in correct ratios to build needed proteins for normal physical and mental development.
- Building block model shows how missing one essential amino acids can be detrimental to normal protein construction.
- In Sanambele, village children traditionally consume grasshoppers from the field to supply tryptophan and other amino acids to their bodies.
- New farming techniques in the areas, especially insecticide sprays, have diminished the grasshopper population, and reduced tryptophan supply in village children’s diet.
- Most recent date indicated are few cases of kwashiorkor in Sanambele but 23% of the children are at risk.

The Site: Sanambele, Mali

- Area of recurrent droughts
- 3-4 months of rainy season June through September
- 45 inches of annual precipitation
- Temps range from 60° F to 102° F (16° C to 39° C)
- May is the driest month but there is NO rain October through May
- The soil is clayey with moderate productivity (British Foreign Commonwealth Agency 2000)

The women and men of the village are the primary farmers. They harvest millet, sorghum, corn, dry upland rice, cow peas, peanuts and a myriad of garden vegetables, as well as shea nuts, cashew, and limes. While the women work in the fields the children look after the younger kids (Dancing Across the Gap, Dr. Dunkel, 2006).

Hypothesis

Tested:

A plant source of tryptophan can be found that the farmers can grow to supplement their diets and alleviate kwashiorkor in Sanambele.

Recommendations

Dates (Phoenix dactylifera): a palm cultivated for the sweet fruits
- Native to The Fertile Crescent and Egypt
- Thrive in dry arid conditions
- Fruits have most protein after being dried, which is a simple procedure
- Very similar to the tried tomatoes
- Date Palms can take up to 16 years to produce fruit but with provide over 250 lbs of dates each year
- Grow to about 20 meters
- The soil in Sanambele may not support the large tap root for the tree
- Contain 33g protein and 0.37g tryptophan for every 100g

Sesame (Sesamum indicum): A flowering plant that produces pods of small seeds
- Native to Sub-Saharan Africa but very adaptable, grown as a cash crop in other parts of Mali at least 1998-2002
- Cultivated in India, China and The Middle East
- Easy to cultivate and dry
- Also easily added to any dish
- Only grows to about 2 ft tall and produces the pods that contain the seeds in the first year
- Contains 17g protein and 0.37g tryptophan for every 100g

Chick Peas (Vigna uncialta): In the legume family
- Originated in Turkey, but very adaptable
- One of the oldest cultivated plants
- Grows about 2 ft tall and produces pods that have 2-3 peas in them
- Thrives in heat
- The peas can be eaten raw or cooked and can also be ground into a flour
- Contains 17g protein and 0.35g tryptophan for every 100g

Conclusion

When introducing a new crop to a village it is vital to keep the holistic goals in mind. Sanambelean farmers came to us because they were worried about their children’s diets and asked if there was anything we could do to help. Now that we have come up with ideas on how we can help, we can share these ideas with village elders and present them, with all benefits and downsfalls considered to the elders to make the final choice, to help them with the decision we have to explain how mothers breast milk contains all the necessary amino acids for development and a child can eat one of these plants to continue to get that nutrient in their diet.

Acknowledgments: Dr. Florence Dunkel, Associate Professor of Entomology, Department of Plant Sciences and Plant Pathology, Montana State University-Bozeman; Dr. Ada Giusti, Associate Professor of French, Department of Modern Languages, Montana State University-Bozeman; Keriba Coulibaly, tenured scientist in Plant Breeding, l’Institut d’Economie Rurale, Sikasso, Mali.

This work was supported by the USDA National Institute of Food and Agriculture (NIFA) Higher Education Challenge Program grant entitled “New Paradigm for Discovery-Based Learning: Implementing Bottom-up Development by Listening to Community Needs While Engaging Them in Participatory, Holistic Thinking” (2007 07-38411-18609) (J. Dunkel, P.I.)