2013 International Year of Quinoa

Quinoa

High quality nutrition
Huge historical importance
Easy to grow, almost anywhere
Bug resistant

So why don't we all eat it all the time?

Background

Most of the world's civilisations rose to greatness with the help of cereals. Grain crops have been harvested, stored and distributed for thousands of years. Cultures in Africa, the Middle East and Europe cultivated wheat, oats and barley while Asian civilisations prospered with rice cultivation. In Central America the Aztecs and Maya grew corn. Further south in the Andes Mountains and surrounding areas people did things a little differently. Quinoa (keen-wa), a relative of spinach and sugar beet, was grown for its seed and not just as a leafy vegetable. Quinoa was the mother grain of the Incas and together with the three sisters corn, squash and beans and other crops including potatoes they had a varied diet.

Chenopodium quinoa (keen-wa; Chenopodiaceae/Amaranthaceae) is known as the mother grain of the Incas. It has higher protein content than the cereals (Poaceae) and has a high lysine content (contrast with cereals: low lysine). It is easy to grow and harvest and does not suffer from the same diseases that attack cereals.

Quinoa is a useful tool in promoting increased food security for most parts of the world. It grows in a variety of situations and is a low input/low maintenance crop. Wheat production is under threat from the Ug99 variant of stem rust which is currently moving across the Middle East and if new resistant lines of wheat can't be developed and deployed in time there will be moderate to severe shortages in the coming years.

Quinoa is a potential buffer against food shortages and encourages greater diversity in agricultural systems (increased resilience). The more efficient use of agricultural land reduces pressure on converting more conservation land to food production. Also quinoa's natural defence system against plant pests (saponins on the grains/seeds) reduces the need for pesticides.

It's been suggested that cereals such as wheat and barley be genetically modified to increase their lysine content, improving their nutritive value. Quinoa already has high lysine content, removing the need for genetic modification.

Associate Professor Paul Guy at Machu Picchu in the Andes Mountains

Paul Guy's Research using Quinoa

I started working with quinoa about 30 years ago when I began my career as a plant virologist. Back then I didn't know that quinoa was the mother grain of the Incas; I used it as an indicator species for virus infection. There are over 1000 plant viruses and identifying them can be quite a job. The first thing I do to identify a virus is inoculate it to a range of indicator species, including quinoa, and see which ones become infected. We have a lot of information on which viruses do or do not infect quinoa which makes it easier to add or subtract a particular virus from your list of suspects.

Even today when I use the same techniques that forensic and other scientists use to detect DNA, RNA and proteins I use quinoa to help validate these other methods.

History

Since at least 3000 B.C., if not earlier, the seed of the plant *Chenopodium quinoa* has been a vital part of the Andean diet, used as a grain in baking, as well as being served in numerous dishes prepared by indigenous peoples found throughout the Andean region.

Historians have attributed the success of the Incan empire, in part, to its ability to feed not only its own population, but those of conquered tribes as well. Through wise cultivation, storage and distribution of indigenous plants, including quinoa, potatoes and corn, the Incans were able to sustain their empire.

With the arrival of the Spanish, this was to change. Farmers were sent into the gold mines of Peru and Bolivia, and non-native crops were introduced for Spanish consumption, thus altering centuries of agricultural patterns. During the colonial period, quinoa use was associated strictly with native populations, leading to an undesirable perception of the seed as belonging to the lower class.

By the beginning of this century, quinoa had lost its status as the Mother Grain. Foreign crops, such as barley, had been introduced and surpassed quinoa in importance. Further decline occurred in Peru in the 1940s when the government began to import large amounts of wheat. Between 1941 and 1974, quinoa cultivation plummeted from 111,000 acres to 32,000 acres. Compounded with the growing acculturation of indigenous populations and the stigma of indigenous identification attached to its consumption, quinoa lost its grandeur and became just another subsistence crop for poorer rural families. However this is changing dramatically, with a surge in interest among Andean nations as well as increasing demand internationally.

Activities

based on the Enviroschools Action Learning Cycle

Identify the Current Situation

1. Research where quinoa comes from. (IS, EfS 1, 2,)
   - What was the significance of quinoa to the Inca? (SS a-b, RDPC, EfS 2)
   - Why has quinoa not been a part of the European diet? (SS a-l, EfS 1-4)

2. Find out what makes quinoa so special. (IS, CS, LS, EfS 1-4)
   - Test quinoa for starch and proteins (PCM)
   - What are saponins? What uses do they have – health and other? (IS, CU, ChS, LS, SC)

3. Why is quinoa being investigated as a future food source? (IS, SS a-l, LS, SC, EfS 1-5)
   - What is the connection with climate change and world population? (PC, US, EfS 1-5)

4. What research or studies have been conducted about quinoa? (US)

Exploring Alternatives

1. Try growing a few quinoa in the classroom or the school garden. (IS, LS)
   - What are the growing conditions needed for quinoa? (LP, Ec)
   - What is the life cycle of quinoa? (LP, Ec, Ev, LS)
   - How does the plant change over time? (Ev, LS)

2. Experiment with different methods of gathering the seed from the plant. (IS, PC, LS)
   - How is/was it harvested elsewhere in the world? (IS, SS e)

3. What affects the growth of quinoa? (Ec, IS, LS, EfS 1-4)
   - How resilient is it? (Ec, IS, LS)
   - Could it become a 'weed'? (Ec, IS, LS, SC, Efs 1-4)
   - What insects or diseases affect it? (Ec, IS, LS, EfS 1-4)

4. What is the yield per plant? (how many seeds does each plant have?) (IS, CU, LS)

5. What is quinoa used for? Experiment with different recipes and cooking techniques (Chs, PCM, LS, SC)

6. Use De Bono's Thinking Hats to discuss this statement – *'Quinoa should be grown instead of wheat or barley or oats.'* (PC, SS a-l, SC, LS, ES, EfS 1-5)

Taking Action

1. Come up with a marketing plan for growing and using quinoa (or not using, depending on the outcome of your Thinking Hats discussion) (SC, ES, PC, SS a-l, EfS 1-5)
   - How will you encourage/discourage other people to grow and use quinoa?
   - How will you sell the idea to other people/farmers/government?

2. Create a quinoa recipe book (PC, LS, SC)

3. Set up your own quinoa growing programme (PC, LS, SC, ES, SS a-l, EfS 1-5)
   - Is there a paddock or a large area at your school you could use?
   - Is there a local farmer who would grow it for you?
   - How will you manage the sowing, watering, weeding, harvesting?
   - How will you replenish the soil before replanting?

Reflecting on Change

1. How will you keep your project going? How sustainable is it?

2. Who would benefit from your actions and knowledge? How can you share this knowledge with others?

3. Where to from here?

Nature of Science

Understanding about science (US)
Appreciate that scientists ask questions about our world that lead to investigations and that open-mindedness is important because there may be more than one explanation.(L1/2)
Appreciate that science is a way of explaining the world and that science knowledge changes over time.
Identify ways in which scientists work together and provide evidence to support their ideas. (L3/4)

Investigating in Science (IS)
Extend their experiences and personal explanations of the natural world through exploration, play, asking questions, and discussing simple models. (L1/2)
Build on prior experiences, working together to share and examine their own and others' knowledge.
Ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations. (L3/4)

Communicating in Science (CS)
Build their language and develop their understandings of the many ways the natural world can be represented. (L1/2)
Begin to use a range of scientific symbols, conventions, and vocabulary.
Engage with a range of science texts and begin to question the purposes for which these texts are constructed. (L3/4)

Participating and Contributing (PC)
Explore and act on issues and questions that link their science learning to their daily living. (L1/2)
Use their growing science knowledge when considering issues of concern to them.
Explore various aspects of an issue and make decisions about possible actions. (L3/4)

Living World

Life Processes (LP)
Recognise that all living things have certain requirements so they can stay alive. (L1/2)
Recognise that there are life processes common to all living things and that these occur in different ways. (L3/4)

Ecology (Ec)
Recognise that living things are suited to their particular habitat. (L1/2)
Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human-induced. (L3/4)

Evolution (Ev)
Recognise that there are lots of different living things in the world and that they can be grouped in different ways. (L1/2)
Begin to group plants, animals, and other living things into science-based classifications. (L3/4)

Material World

Properties and changes of matter (PCM)
Observe, describe, and compare physical and chemical properties of common materials and changes that occur when materials are mixed, heated, or cooled. (L1/2)
Group materials in different ways, based on the observations and measurements of the characteristic chemical and physical properties of a range of different materials.
Compare chemical and physical changes. (L3/4)

Chemistry and Society (ChS)
Find out about the uses of common materials and relate these to their observed properties. (L1/2)
Relate the observed, characteristic chemical and physical properties of a range of different materials to technological uses and natural processes. (L3/4)

Social Sciences (SS)

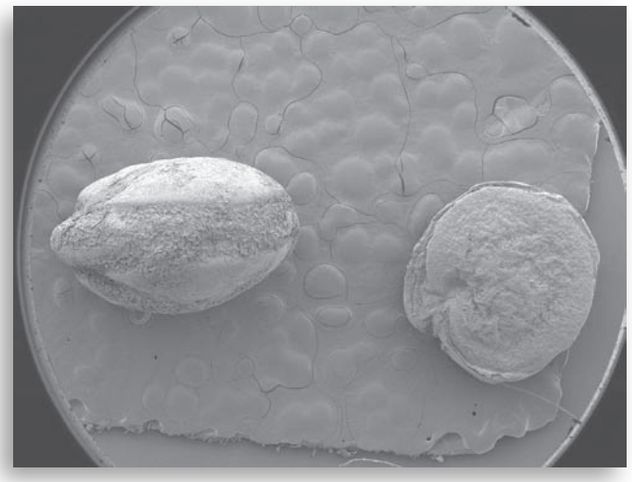
Social Studies
a. Understand how people make choices to meet their needs and wants. (L2)
b. Understand how time and change affect people's lives. (L2)
c. Understand how people make decisions about access to and use of resources. (L3)
d. Understand how groups make and implement rules and laws. (L3)
e. Understand how exploration and innovation create opportunities and challenges for people, places, and environments. (L4)
f. Understand that events have causes and effects. (L4)
g. Understand how producers and consumers exercise their rights and meet their responsibilities. (L4)
h. Understand how formal and informal groups make decisions that impact on communities. (L4)
i. Understand how people participate individually and collectively in response to community challenges. (L4)

Nutrition and Cooking

Quinoa's surge in popularity is due to its tremendous nutritional value. Its high protein content (12 to 18 percent) outranks other grains. What's more, it's one of the few vegetarian foodstuffs considered to be a complete protein, containing all eight essential amino acids. Compared to other grains, it's high in unsaturated fat and low in carbohydrates. It's a great source of fibre, iron, magnesium and phosphorus. And if that's not enough to recommend it, quinoa is also gluten-free and widely considered kosher for Passover.

Quinoa cooks like rice. But go easy: quinoa cooks much faster than rice and swells to four times its original volume. Before cooking, rinse under cold water until water runs clear. Quinoa's delicate taste is often compared to couscous, and it's a great choice for salads and pilafs.

Cooked quinoa x37 magnification



Quinoa seed x25 magnification

Recipes

Cooked Quinoa

Ingredients
1 cup quinoa
1 ½ cups water

Directions
1. Soak the quinoa for 5 minutes in cold water
2. Rinse thoroughly 2 times, pour off the water and drain through a large fine mesh strainer
3. Place in a large pot with the water (and salt, for salad or savoury dishes)
4. Cover the pot, bring to a full boil, turn the heat to low, and cook for 15 minutes
5. Remove from heat and set aside to cool

Simple Delicious Quinoa Breakfast

2 servings Total prep and cook time: 20 minutes

Ingredients
1 cup cooked quinoa
2 tbsp sunflower seeds, pumpkin seeds, or chopped walnuts
2 tbsp raisins
2 tbsp chopped dried apricots
Substitute dried cranberries, currants, blueberries, chopped figs or dates as you like
¼ tsp salt
½ tsp cinnamon
1 cup almond, hemp or soy milk, flavoured or plain - add more as needed. Or use dairy milk if you prefer.
Optional: 1 tbsp maple syrup, brown rice syrup or other sweetener

Directions
1. Combine all ingredients in a large saucepan
2. Heat on medium-low, stirring, until the quinoa has soaked up the liquid, and the dried fruit has plumped up nicely
3. Add more milk if needed until the consistency pleases you
4. That's it. Enjoy!

Cooking tips: If you don't have cooked quinoa, but want to eat this quinoa breakfast recipe NOW, just cook everything along with the raw quinoa. Use 1/4 cup raw quinoa, and add the other ingredients along with 1/2 cup water. Make extra so you can eat quinoa for breakfast again tomorrow!

Simple Quinoa Salad Recipe

4 servings Total prep and cook time: 30 minutes

Ingredients
Cooked quinoa
1 cup snow peas, shell peas, celery, or green beans
2 small carrots, peeled and sliced thin
½ green or red pepper, sliced thin
1 medium ripe tomato
1 medium cucumber, peeled and diced
¼ cup chopped fresh parsley, cilantro, or basil
½ cup chopped walnuts, toasted sunflower seeds or toasted cashews

Dressing
2 tbsp freshly squeezed lemon juice
2 tbsp olive oil
¼ tsp salt
Fresh ground pepper
Options: Pinch of cayenne, garlic powder or fresh minced garlic, minced fresh or dried ginger

Directions
1. Use quinoa cooked as described above
2. Steam the carrots and green veg for 5 minutes or until tender-crisp, drain, rinse in cold water and drain again
3. Chop the tomatoes, herb and cucumber
4. Blend dressing ingredients with a whisk or shake in a jar
5. Gently combine veggies, walnuts, quinoa and dressing in a large bowl
6. Cover and chill, or serve immediately

Enviroschools' 5 Guiding Principles

1. Empowered Students
Students making decisions and taking action with the knowledge they have learnt

2. Sustainable Communities
Creating partnerships within schools, communities to nurture people and nature now and in the future

3. Learning for Sustainability
Fosters learning *in*, *about* and *for* the physical, social, cultural and political aspects of the environment

4. Māori Perspectives
Exploring Māori knowledge and honouring cultural traditions and perspectives

5. Respect for Diversity of People and Cultures
Exploring the understandings, perspectives, views, and values of others

Education for Sustainability

Aims

1. Develop an awareness and sensitivity to the environment and related issues

2. Develop knowledge and understanding of the environment and the impact of people on it

3. Develop attitudes and values that reflect feelings and concern for the environment

4. Develop skills involved in identifying, investigating, and problem solving associated with environmental issues

5. Develop a sense of responsibility through participation and action as individuals, or members of groups, whānau, or iwi in addressing environmental issues

Acknowledgements

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