

Seedless Fruits and Vegetables

KidsPost

HOW do seedless plants grow?



More than 200,000 of watermelons are produced in the United States every year. Most are seedless because it's easier to grow them that way. But some farmers still grow melons with seeds.

Y

GLOSSARY

MAKING BETTER PLANTS

HOW A SEEDLESS WATERMELON IS MADE

1. The plant breeder would like to have a watermelon that has more flesh and less seeds. So he or she takes a watermelon with lots of seeds and pollinates it with pollen from another watermelon that has few seeds.
2. The new watermelons will have some seeds, but probably not as many as the original watermelon. This is because the pollen from the watermelon with few seeds has more genetic material than the pollen from the watermelon with lots of seeds.
3. The new watermelons will have some seeds, but probably not as many as the original watermelon. This is because the pollen from the watermelon with few seeds has more genetic material than the pollen from the watermelon with lots of seeds.

MEET A PLANT BREEDER

THINK OF SEEDLESS WATERMELONS AS THE MULES OF THE VEGETABLE KINGDOM.



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How and Why: Seedless Fruits and Vegetables

Lesson: Seedless fruits and vegetables have been developed by scientists to improve existing varieties, to create new varieties and to meet consumer demands.

Level: Low to high

Subjects: Science, health, language arts

Related Activity: Art, home economics, economics

This online guide is related to a new series of science-focused KidsPost articles. Students ask the questions, scientists and Washington Post science writers give the answers. In addition to suggesting activities for using the KidsPost articles, sidebars, timelines, graphs and charts, activities are provided for older students in related disciplines.

Where might you find seedless fruits and vegetables in the pages of The Washington Post? In Food section recipes that encourage the mix of feta and goat cheeses with watercress, chopped red tomatoes and diced seedless watermelon. In Science articles in which reporters introduce new varieties of seedless grapes and eggplants. In Business section pages, where seedless tomato fruit sales are compared to profits from older varieties. In the Reliable Source where we learn that Jennifer Lopez's contract "rider" a few years ago specified white couches, white roses, white candles, honey-peanut butter Balance Bars and green seedless grapes."

The suggested questions and activities in this guide include the same variety as Post coverage and the classes found in students' schedules.

Teachers may also wish to use The Post NIE online guide *Leaves* that focuses on photosynthesis

and the life cycle of leaves. Go to www.washpost.com/nie and in lessons plans select *Leaves*.

Read About Seedless Watermelons

Give students a copy of "How Do You Grow Seedless Watermelon?" written by Post science reporter Rick Weiss. The following questions may be used with the Oct. 25, 2005, KidsPost article.

- For how many years have people cultivated watermelons?
- Why was the watermelon particularly useful in North Africa and the Middle East?
- What evidence exists that watermelons were valued in Egypt?
- How many seeds may be found in a regular watermelon?
- In what country was the first seedless watermelon developed? How many years did this team of scientists work on this project before they were successful?
- What procedure was used to develop seedless watermelon?
- Weiss makes a comparison of seedless watermelons to mules. List the ways in which mules and watermelons are not alike. In what ways are mules and seedless watermelons alike? Explain to students that the pairs of an analogy do not need to share a large number of similar characteristics or qualities. Those that they do share should be distinct.
- For what reasons did scientists work to develop seedless watermelons, according to the article?
- What are the white specks found in seedless watermelons? Are they edible?
- Give evidence that the American consumer has accepted seedless watermelons.

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Timeline

4,000 to 5,000 years ago: Egyptian hieroglyphics depict farmers harvesting watermelons. Gradually they spread throughout the Mediterranean region, popular as food and as nature's bottled water.

10th century: Watermelons reach China

13th century: Watermelons spread through Europe

16th century: Watermelons appear in North America, probably arriving on slave ships from Africa and the Caribbean

20th century: Scientists create seedless watermelon varieties

21st century: New colors? New flavors? Seeds that taste like M&Ms? What would you like to see?



FILE PHOTO — THE WASHINGTON POST

Seedless watermelons are harvested on a farm in Maryland.

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After reading the article and discussing the questions, perhaps students could sample a slice of a seedless watermelon. No chance of a seed spitting contest beginning.

Describe Seedless Fruits and Vegetables

Visit a farmer's market or the produce section of a local grocery store so students can become acquainted with the colors, textures, sizes and shapes of fruits and vegetables. If you cannot visit a farmer's market, set up a display of grapes, eggplants, pumpkins, squash and other fruits and vegetables in the classroom. You may decide to have all be seedless or mix them and see if students can discern which are seedless from the exterior appearance.

Help students to understand the importance of reading the labels provided by produce providers. Compare and contrast several items through information found on their labels.

You may also name the produce using foreign languages. Watermelon, for example, would be pastèque (French) anguria (Italian), suika (Japanese), sandia (Spanish) and lubenica (Croatian).

Ask each student to select one fruit or vegetable to describe:

- using the five senses and color,
- using similes,
- using comparison and contrast,
- using connotations.

Store the item in a brown paper bag, labeled with each student's name. One to two class periods later, ask students to write a story in which the fruit or vegetable is a participant. Include a description of the produce in its current condition.

One to two class periods later, ask students to write a poem, ode or short essay addressing the fruit or vegetable. Are some showing signs of decay more than others? You may wish to cut into the fruit or vegetable to write a more analytic piece, a dissection of the produce.

Illustrate Produce

Use the display of fruits and vegetables for an art project. Whether the medium is oil, watercolor, pastels, pencils or torn paper, a display of fruits and vegetables can inspire still life compositions. Either before or after the exercise, you may share examples of still life artwork from different periods and countries. The examples could illustrate single fruit subjects, combinations of fruits and vegetables, different lighting and setups.

How Do They Do It?

Give students the illustrated "How a Seedless Watermelon Is Made" page. Discuss the steps that lead to a seedless watermelon. Use the glossary that is provided in this guide.

Research

Seedless fruits and vegetables have been developed for consumer consumption. These new and improved varieties offer a wide range from which to select and to research. Give students "Making Better Plants." This reproducible serves as a starting point for exploration of the seedless varieties that have been developed and some of the individuals who have been involved.

Give students "Not a Seedy One in the Bunch." This activity involves Internet research

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GLOSSARY

Some important words about plant breeding

Diploid

(DIP-lloid) Having a pair of each type of chromosome

DNA

(short for deoxyribonucleic acid, which is pronounced de-OX-e RI-bo-nu-clay-ic acid). The famous basic strands of life. DNA carries coded information about what characteristics living things will pass on, in its unique ladder shape.

Chromosomes

(pronounced CROE-ma-somes) The parts of living cells that are made up of bundles of DNA and protein inside cells. Chromosomes carry DNA's code on genes. Human cells have 23 pairs of chromosomes. Regular watermelon plants have 22 pairs and seedless ones have 33 pairs.

Gene

(JEAN) Genes are the basic unit of heredity. Traits, such as whether a watermelon has seeds or not, are determined by the information carried in genes. Chromosomes can contain hundreds of genes.

Genetics

(je-NET-ix) The branch of science that studies how traits are passed on

Heredity

(heh-RED-i-tee). Passing on biological traits or characteristics from parents to offspring (including parent plants) by passing on genes

Parthenocarpy

(PAR-th-no-kar-pe) The production of fruit without fertilization

Pollination

(POL-eh-na-shun) Transfer of pollen from an anther to a stigma of the same flower

Tetraploid

(TET-ra-ploid) A cell having four chromosome sets

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skills and the disciplines of science, economics, and language arts. You may wish to include knowledge of the vocabulary terms found in the sidebar of this guide. Questions that the research will address include:

- What is the history of and science behind the development of seedless fruits and vegetables?
- What is the economic and environmental impact of the research and development?
- What countries and scientists have been involved in development?
- What other fruits and vegetables have the potential to be seedless?

EurekAlert has a section of news for kids. This site is a good starting point for research on recent developments and discoveries in science.

Take it to the Bank

Examine the economics involved in development of seedless fruits and vegetables. Areas of consideration include:

- Why would horticulturists want to develop seedless fruits and vegetables? This would include no requirement to pollinate, reduced dependence on bees and warm weather.
- What costs are involved in breeding new varieties or improving older strains? What is involved in research and development?
- Who benefits from marketing, distribution and availability of new varieties?
- What environmental benefits and drawbacks are involved?

Create a Recipe

Seedless fruits and vegetables are presented in the finest restaurants, served at family dinners and tucked into brown bag lunches. Give students "Revisiting Melon." This Post Food section article and recipe inspired the activity that follows. Provide students with a list of seedless fruits and vege-

tables (See "Not a Seedy One in the Bunch" or have them do some research to create the list). Students may be divided into four groups to create the following types of dishes. Each recipe should use two or more seedless fruits and/or vegetables. Remind students to consider flavor and coloring in their recipes; for example, seedless grapes are white, red and black in color.

Depending on your course, students may even be asked to prepare the dishes according to their recipes. Provide information on the nutritional value of each dish. Class members could sample each dish. Give an award for the best dish.

- Create a recipe for a dish to be served at a formal dinner. Prepare or illustrate a centerpiece for the table using seedless fruits and vegetables.
- Devise a recipe for a dish to be served at a family dinner. Prepare or draw a picture of the table setting.
- Create a dessert recipe using two or more seedless fruits. Prepare or illustrate the dessert as it would be served.
- Create a brown bag lunch dish that students would enjoy eating and be healthy for them. Craft or draw a picture of the lunch bag and the container that would hold the dish.

What Else?

1. What novelty vegetables exist and which would you like to breed? How about carrots that are yellow, maroon or red? They exist. What about fruits? Would you like blackberry bushes without thorns? They exist. Read about them, then think of something new.

2. Phytochemicals are natural compounds that prevent disease. What research is being done on modifying the content of vegetables to contain more or some phytochemicals? What if certain diseases could be stopped or slowed and health improved by eating more of these new varieties?

Resources

www.eurekalert.org **EurekAlert**

This global news agency of the American Association for the Advancement of Science (AAAS) is a clearinghouse for news and the latest science information from universities, medical centers, journals, government agencies, corporations and other agencies engaged in research.

www.usda.gov **U.S. Department of Agriculture**

Articles, reports, research including growing and marketing of U.S. farm and ranch products. Begun in 1862, the USDA was called the "people's Department" by President Lincoln since "58 percent of the people were farmers who needed good seeds and information to grow their crops."

www.mypyramid.gov **My Pyramid**

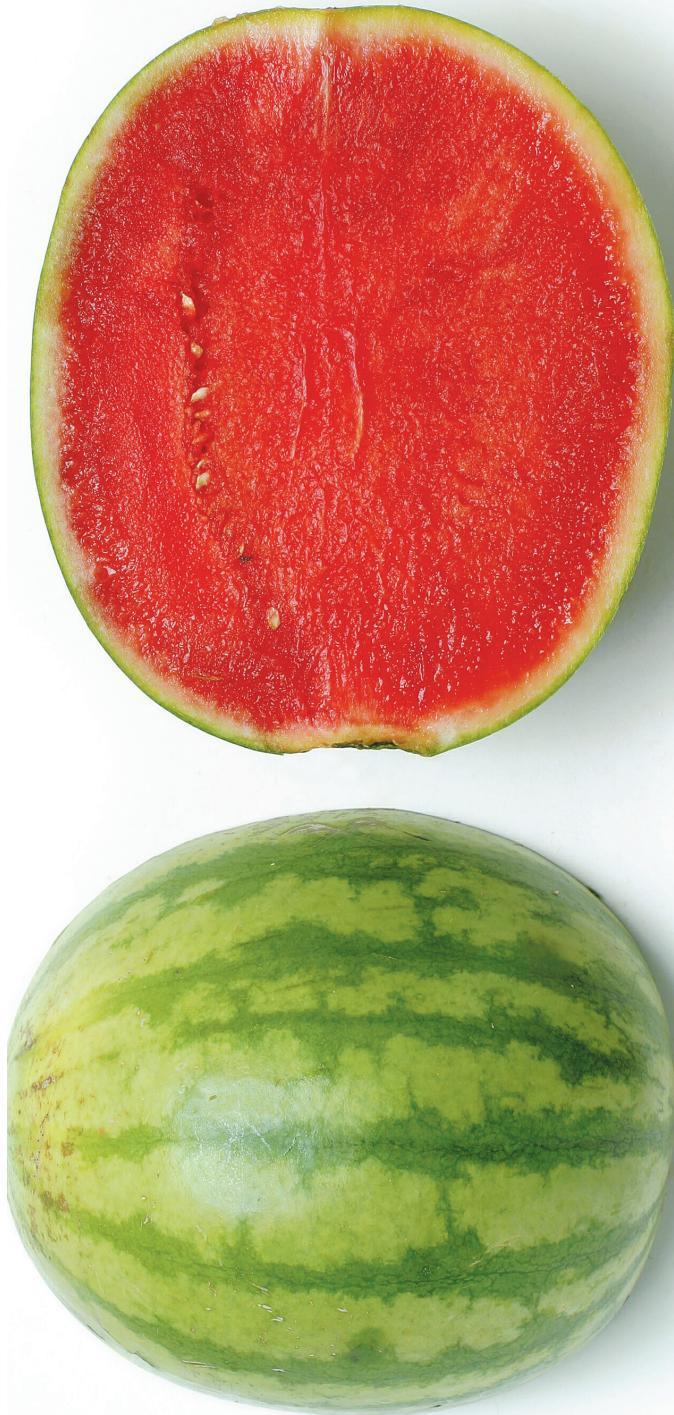
U.S. Dept. of Agriculture educational material for elementary school teachers. Poster, lessons, worksheets and CD.

3. Pretend that you are the maker of candy-coated raisins. Why might you be interested in the development of a sweet, seedless grape?

4. Learn more about the U.S. Department of Agriculture world seed collection.

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How Do You Grow Seedless Watermelon?



Think of seedless watermelons as the mules of the vegetable kingdom.

Mules are what you get when a male donkey mates with a female horse. Mules are born sterile, which means they cannot make babies when they grow up. The only way to make more mules is to start over with a donkey and a horse.

Seedless watermelons work the same way. They are the offspring of two different kinds of watermelon plants. These watermelons are healthy as a mule, not to mention sweet and delicious. But like mules, they can't make more of themselves. The farmer or gardener must start from scratch each year.

Scientists doing experiments in Japan made the first seedless watermelons about 70 years ago. But in some ways, they are the fruit of 5,000 years of work. That's how long people have been growing – and gradually improving – watermelons as part of an age-old human effort to make better foods through the scientific specialty known as plant breeding.

Ancient varieties were full of seeds. But with a water content of about 92 percent they were incredibly valuable to nomads in the North African and Middle Eastern deserts, who used them as natural canteens. Some Egyptian pharaohs were buried with watermelons, to serve as snacks in the afterlife.

Even today, regular watermelons have up to 1,000 seeds per melon. That's great if you're in the mood to do some spitting, but a hassle if you want to scarf down mouthfuls of sugary, ruby red flesh.

Scientists had another reason to get rid of the seeds: The softer tissue surrounding the seeds is the first to get mushy as a watermelon ages. A seedless watermelon, they reckoned, would stay sweet and fresh longer.

It took Japanese scientists about 15 years of complex breeding experiments to come up with a melon that was truly seedless. They did it by crossing two varieties with very different numbers of chromosomes, which are the bundles of DNA inside cells. Today seedless varieties account for more than half of all watermelon sales in the United States. (Those little white things you see are the shrunken outer husks of the seeds that never were, and are fine to eat.)

Seedless melons are generally sweeter than ordinary melons, in part because all that energy that would have gone into making seeds can instead go into making sugar.

Improvements keep coming. A new variety of seedless watermelon is as small as a softball – making it easy to pack in a lunch – and has a rind that, although very thin, is so strong that three 10-year-olds with very good balance could stand on one without breaking it.

Which, come to think of it, could be as much fun as spitting seeds.

—By Rick Weiss

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Making Better Plants

Kids tend to look like their moms and dads, and the same rule applies to plants.

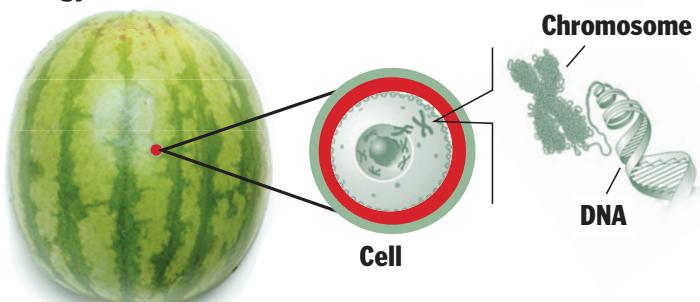
The passing of traits from generation to generation is called heredity. And the field of science that focuses on the rules of heredity is called genetics. For thousands of years, farmers and gardeners have taken advantage of the rules of heredity to create new plants with bigger and sweeter fruits and with greater resistance to disease, drought and insect pests. Scientists who do this are called plant breeders.

These scientists use pollen from the best male plants to fertilize the best female plants. They have brought us big juicy ears of corn (varieties from several hundred years ago were about the size of your thumb) and blackberry bushes that don't have thorns.

In recent years, scientists have learned how to make new plant varieties even more efficiently by "genetic engineering." They insert or delete pieces of DNA, the genetic material that is packed inside a plant's chromosomes. Among their results: corn plants that make insect-killing chemicals in their leaves, so farmers don't have to spray them, and soybeans that will not die when farmers accidentally splash them with weed killers.

But those advances bring new concerns too. Pollen from some of these plants has already spread accidentally to nearby weeds, making those weeds stronger. Scientists are now developing ways to keep new plant traits where they belong.

Biology of a watermelon



MEET A PLANT BREEDER

Kim Lewers used to play around in her yard, sprinkling dust-like particles of pollen from one flower onto another so new flowers with novel color combinations would pop up the next spring. She went on to get a graduate degree in plant breeding and today she works for the Department of Agriculture's Fruit Laboratory in Beltsville, Maryland.

"Plant breeding is the greatest



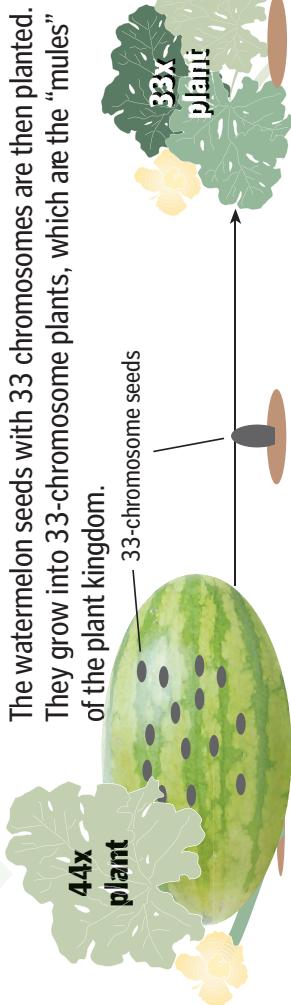
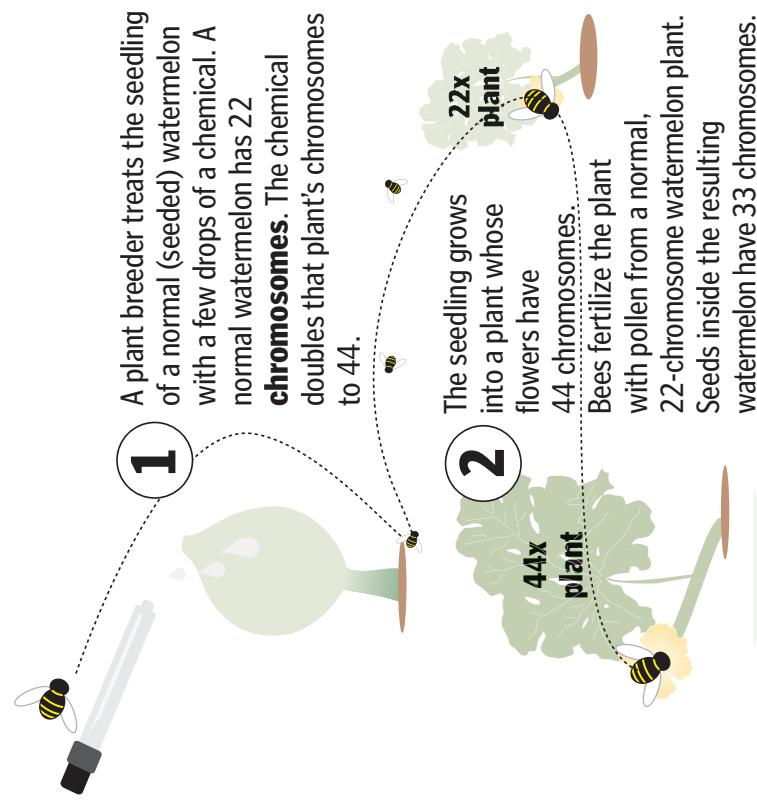
Kim Lewers works for the USDA's Fruit Laboratory.

thing!" she says. Of course, she adds, not every experiment works. Sometimes you end up wth a fruit or a flower that's worse than what you started with. "That's one of the fun things about it. You never know quite what you'll get."

Here's a helpful hint from Kim's years of breeding fruits for better flavor: If you're picking strawberries or other fruits to eat, pick them around 4 in the afternoon. "That's when the fruit is producing the most sugars," she says.

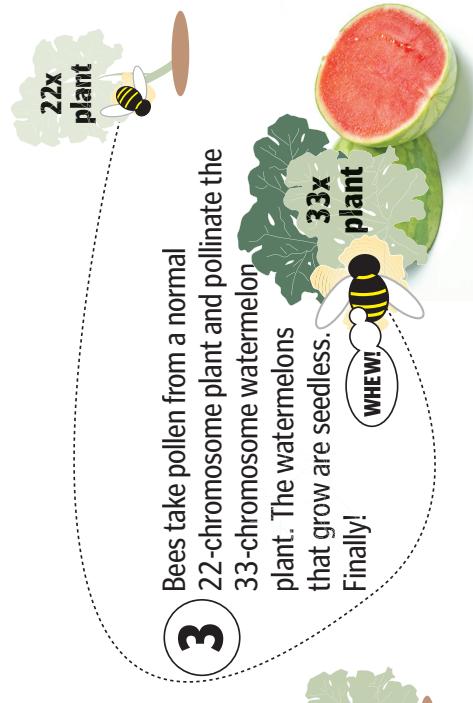
How a Seedless Watermelon is Made

There are several ways to produce seedless fruits and vegetables. Many are an exception to the normal fertilization process. Creation of seedless watermelons requires seeds and pollination, and makes use of parthenocarpy. Plant breeders are busy as bees producing triploid and tetraploid seeds.



Picking it yourself? Four o'clock in the afternoon is the best time to pick a watermelon (same with strawberries and other fruits). That's when the sugar content is at its highest.

Scientifically speaking, watermelons are both fruits AND vegetables. The plants themselves are vegetables (their closest relatives are squash, pumpkins and gourds) but the part you eat is the “fruiting body” (or reproductive organ) of that vegetable plant.



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Not a Seedy One in the Bunch

You might have eaten seedless fruits in your lunch or on a picnic. Your mother may be fond of using seedless vegetables in favorite recipes. You might even find them mentioned in news articles such as one recent one that reported:

Sure, it's scary to find black widows on store-bought grapes. But food safety specialists and growers say the poisonous spiders are less frightening than the alternative: a return to harsher pesticides.

At least three people found the spiders on bunches of red seedless grapes from California purchased recently at separate Shaw's supermarkets in suburbs west of Boston.

You are about to become an expert on one seedless fruit or vegetable. Select one of the items listed below that can be bought in a seedless variety.

- Apple
- Banana
- Cantaloupe
- Cucumber
- Eggplant (aubergine)
- Grapefruit
- Grapes (white, red, black)
- Green peppers
- Orange
- Pineapple
- Tangerine
- Tomato
- "Washington Navel" orange
- Watermelon

Your research should include the following:

- What is the history of and science behind the development of the seedless fruit or vegetable? Is research completed or still in the development stage?
- What countries and scientists have been involved in its development?
- What scientific method, genetic modification or natural function was used in creating this seedless fruit or vegetable?

- What other fruits and vegetables have the potential to be seedless using the same method?
- What is the environmental, economic, scientific and cultural impact of the research, genetic engineering and development?

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Revisiting Melon

By Stephanie Witt Sedgwick

Every year we have a Fourth of July party, and every year someone brings a watermelon. Some years it rains, some years it's clear. The guest list changes, but the watermelon always shows up.

It's been a sort of guessing game in our house to wager on who's bringing the melon. With the chicken frying, the salads made and brownies piled high, one could say the watermelon has always been, well, unwelcome.

This year, looking at the sugar baby sitting on the counter, I decided to give it a second chance. The melon could be sliced and placed on the buffet as always, but there had to be more to do with it than that.

After all, watermelon's attributes go beyond a cooling, thirst-quenching slice of something on a hot summer night. Weight Watchers has recently been touting its nutritive benefits as a fat-free, low-calorie, vitamin- and mineral-packed food as well as its versatility as an ingredient. It was time for another look.

It has vitamins C, A, B6 and thiamine as well as lycopene — as much as 40 percent more of this antioxidant. According to the Agricultural Research Service, scientists have found that lycopene in the diet correlates with a reduced incidence of certain types of cancer. And lycopene levels in fat tissue — an indicator of lycopene consumption — have been linked with a reduced risk of heart attacks.

Plus, one cup of watermelon contains a total of 48 fat-free calories.

Once I got to thinking, the possibilities unfolded:

The fruit can be pureed for a refreshing drink, a summer soup or as the basis for a low-fat salad dressing.

Grilled slices can serve as an edible base for poached fish. When diced, the fruit mixes well in chicken, seafood and fruit salads.

Cooked down, watermelon can enrich glazes, barbecue sauces and be used to sweeten all manner of things such as iced tea.

For dessert, slices can be layered with sorbet to create an alternative "ice cream" sandwich or with fruit for a cakeless trifle.

Watermelon, our unwelcome guest, might just turn out to be the life of the party.

Shrimp and Watermelon Salad

4 servings

Here, bites of watermelon taste great with shrimp that has a little heat. If you'd rather use a grill pan on the stove to cook the shrimp, skip the bamboo skewers. Adapted from *Delicious Salad Meals*, by Dot Vartan (Dorothy Jean Publishing, 2005).

2 tablespoons Mexican seasoning (may substitute a mixture of cumin, dried onion, chili pepper and garlic powder)
 1 teaspoon cinnamon
 1 dozen jumbo shrimp, peeled, deveined and tails removed
 2 cups cubed, seeded watermelon
 One 20-ounce can pineapple chunks, drained
 1/4 cup diced green or yellow bell pepper
 1 teaspoon finely chopped and seeded jalapeno pepper (optional)
 1/2 cup peeled and diced seedless cucumber
 2 tablespoons fresh lime juice
 2 tablespoons low-sodium soy sauce
 2 tablespoons honey
 1 tablespoon olive oil
 8 cups torn romaine lettuce
 2 tablespoons chopped cilantro

Have ready 8 bamboo skewers that have been thoroughly soaked in water.

On a large plate, combine the Mexican seasoning and cinnamon. Dredge the shrimp in the seasonings, and set aside.

In a medium bowl, combine the watermelon, pineapple, bell pepper, jalapeno pepper, if desired, and cucumber. Cover and refrigerate.

In a small bowl, whisk together the lime juice, soy sauce, honey and olive oil until well combined; set aside.

When ready to cook the shrimp, prepare the grill. If using a gas grill, preheat the grill to medium-high. If using a charcoal grill, start the charcoal or wood briquettes. When the briquettes are ready, distribute the heated charcoal evenly under the cooking area for direct heat. Be sure to oil the grate with nonstick spray oil.

Thread the shrimp onto the soaked bamboo skewers and grill, turning once, for 5 to 6 minutes or until the shrimp are just opaque. Remove the shrimp from the skewers.

Divide the lettuce among individual plates and place the shrimp and watermelon mixture on the lettuce. Drizzle the dressing on top, and sprinkle with the chopped cilantro. Serve immediately.

Per serving: 306 calories, 27 g protein, 39 g carbohydrates, 7 g fat, 172 mg cholesterol, 1 g saturated fat, 481 mg sodium, 5 g dietary fiber

