True Potato Seed Has Many Advantages

ECHO Inc.

ECHO has just purchased two hybrid varieties of true potato seed (*Solanum tuberosum*) to share with our overseas network. This important subject requires some explanation though before discussing the details of these two varieties.

For centuries people have propagated potatoes by planting potato tubers, or pieces of tubers, that have "eyes" from which sprouts will originate. These are commonly called "seed potatoes." This name can be confusing because they are obviously not seeds. I prefer the less confusing name, "seed tubers."

Another important term is "certified seed potatoes." As potatoes are grown and the tubers harvested, stored and replanted year after year, diseases build up in the tubers. The result is that the yield of potatoes decreases over time.

In order to get better yields, farmers can purchase potatoes that have been grown under extra-watchful (and I presume government-inspected) conditions and contain almost no disease. These are called "certified seed potatoes." Unfortunately, in many countries certified seed potatoes are only available if someone imports them. They are heavy, bulky and perishable, so transportation costs to import potatoes and then deliver to the farmer are considerable.

But potatoes do produce seeds, so to help distinguish these from "seed potatoes" the seeds are called "true potato seeds" (TPS). Yet it takes only 160 grams of TPS to seed one hectare (2.3 ounces/acre) and half that amount if seeds are used for transplants. That compares with over 2,000 pounds/acre of seed tubers.

Another advantage is that TPS is always ready to be planted. I recall one summer when my father ran out of seed tubers in our garden. We went to the grocery store and bought some potatoes and planted them. Only after they failed to sprout did it occur to us that those potatoes might have just been harvested in a warmer part of our country and had not been dormant long enough to sprout.

There are now companies that grow true potato seed under equally careful conditions and produce seed that is even more disease and insect free than certified seed potatoes. So why not grow potatoes from true seeds like other vegetables?

Until recently the reason has been that TPS has great genetic variability. In other words, the genetic makeup of every potato grown from seed was unique. The Ontario Ministry of Agriculture and Food (Fact sheet 84-034, July 1984) states that in the 1800's Luther Burbank planted TPS and carefully checked each plant. He

selected one that was especially good that had a russet color. He named it the "Russet Burbank." This continues to be one of the highest quality potatoes a century later (sometimes called Idaho baking potato in North America). In the early 1900's competitions were held at some fall fairs in Canada for the best potato varieties produced by gardeners from TPS.

The International Potato Center (CIP) located in Peru specializes in potato research. (It is one of the international research centers in the CGIAR network–See ECHO's book Amaranth to Zai Holes p. 39). One of their interests is TPS. Their small book True Potato Seed: Past and Present Uses by Malagamba and Monares (1998) provides a helpful perspective on use of TPS.

TPS has potential to extend the areas where potatoes can grown "where there is at least one season of approximately three months duration of climatic conditions favorable to potato cultivation." (More on this later).

In warm regions there are three primary problems for potato growers. First, insects that transmit viruses from plant to plant present a much more serious problem than in major potato producing areas, which have milder climates. Virus buildup in the plants, transmitted in the seed tubers, quickly depresses production. Second, it is very difficult to store seed tubers in such warm climates.

A third problem is that "in many subsistence agriculture areas of the warm tropics, farmers do not grow potatoes because they do not have access to good [planting material] or have not found a way to store seed tubers under high temperatures." Under such conditions, "direct transplanting of seedlings [from TPS] into the field appears to be a very suitable system." "Once the seedlings have reached a desirable size, excellent growth and field performance are obtained by transplanting them either between the rows of a preceding crop–such as maize that is finishing its growth cycle–or in association with other crops of comparable growth habits. When storage conditions are favorable, part of the tubers produced from transplanted seedlings can also be utilized as planting material for the following season."

In 1982 ECHO shared with our network the first TPS that was sold to gardeners in the USA. It was called 'Explorer potato.' The results were disappointing.



Explorer Potato, on the right, is small compared to a carefully controlled hybrid cross on the left. Photo from Ontario Ministry of Agriculture and Food.

The Ontario report cited above evaluated 'Explorer' and found that there was considerable variability among plants in terms of type, size, skin color, shape of the tubers, size of the plant, days needed until maturity and cooking quality. In fact they required about 180 days to produce a crop. Tubers were about a quarter of the size that

people expected. If these small tubers were stored till the next season and then planted, the harvest was then about normal. For those willing to put in this extra effort it was indeed a way to get a start at disease-free potatoes.

Until the hybrids we will tell you about came on the market, we recommended using TPS only as a start to disease-free seed tubers or as part of an effort to find a better potato for the region where you work. The latter can be done with minimal expense, as in the following account.

According to Hans Renia and Peter van Hest ("Botanical Potato Hybrid Seed is Ready for Market," Seed World, January 1998, pp. 24,25) in the last decade there have been major advances in producing large quantities of hybrid seed and in the quality and uniformity of the product.

In 1995 the United States for the first time allowed importation of TPS. A company was formed that began to produce TPS in southern Chile where there are no major potato diseases. It is now owned by Bejo Seeds in the Netherlands. Now TPS are available at a reasonable price, in quantity, and have potential to compete with certified seed tubers.

In fact in 1997 in South Africa over 100 tons of harvested tubers from TPS plants were sold to the processor for the fast-food chain McDonalds, which has very high standards for their potatoes.

Aside from the question of seeds or seed tubers, is it even possible to produce potatoes in warm climates? Only in some situations. I called Peter van Hest with Bejo Seeds.

He said that potatoes will not produce tubers unless temperatures are less than approximately 70°F (21°C). Also they will not produce tubers if the difference between the day and night temperatures is less than 10 Fahrenheit degrees (5.6 centigrade degrees).

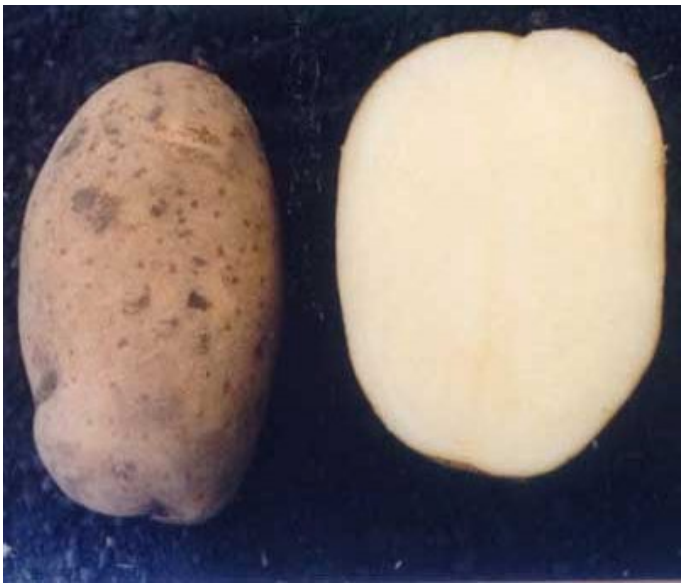
"Potatoes are also sensitive to day length. Potato varieties selected for temperate climates will set tubers during long days, [and probably during short days of the tropics too] but most tropical varieties will not begin to set tubers in northern latitudes until September when the day length is closer to 12 hours. In India we work with hybrids developed by CIP. In general a variety developed in and for the tropics might be better than one developed for higher latitudes. But CIP does not produce seed for sale, so it can be difficult to obtain enough for commercial use. Also CIP would be more concerned about general food use than quality and uniformity. "

According to Dr. VanHest, "Our variety called 'Zolushka' has shown wide adaptability in Indonesia and is an allpurpose potato suitable for many uses. The latest TPS varieties developed for the tropics by CIP might give a higher total yield (if you could find a commercial source), but ours would probably give a more commercially desirable product. Another good all-purpose variety is 'Catalina.' It has proven versatile in the USA, South Africa, Egypt and Russia."

Is there any value to TPS in higher elevations of the tropics where potatoes are already a major crop? Chances are that diseases build up less quickly in such regions, but sooner or later either seed tubers or TPS will need to be used to

maintain maximum yields. The factors of expense, transportation and storage already discussed may or may not favor TPS.

Because climate is likely to be more suited to storage than in warm climates, a few farmers might grow TPS through a couple seasons to produce seed tubers with minimal disease content–better than local potatoes used for replanting but still not “certified” seed tubers. Another option is to grow TPS plants at closer spacing and harvest large numbers of small tubers to be stored for planting the next season. In fact, very small tubers are now commercially available and can be less expensive to import than large seed tubers.


Zolushka.’ Photo from Potato Products International, Ltd.

How to obtain seeds. ECHO has purchased seed for both 'Zolushka’ and 'Catalina.’ These are pelleted seeds, which means each tiny seed is enclosed in a material that makes it easier to handle. Those working with agricultural development programs in developing countries can obtain a free packet of each for trial. Others can order for $3.25 per packet plus $1 per order. The European Union does not permit importation of TPS, so European workers in the tropics should be sure to give your tropical address.

Two varieties are available. 'Zolushka’ has medium early maturity. It produces round-oval, medium to large tubers of uniform shape, shallow eyes, smooth white skin, cream/white flesh. Yield is good to very good. Broad range of adaptability over years and environments. Occasional growth cracks. Texture is fairly firm on boiling, little discoloration before or during cooking. Highly recommended for chips and fries.

'Catalina’ has medium/late maturity. It produces flat oval, fairly large, very uniform and attractive tubers with smooth white skin and shallow eyes, cream/white flesh. Fairly firm texture on boiling; relatively free from discoloration before or during cooking. Occasional purplish spots in flesh in up to 3% of tubers if improperly grown (but these have no effect on health or taste).

What should I do if the potatoes do very well? We have been waiting to feature TPS until there were both good varieties AND commercial sources. (There is little point in doing a variety trial if you cannot purchase seeds nor save your own seeds). You can purchase additional packets from ECHO or purchase seeds in quantity from the Bejo seed company [not listed in 2015]. They also have subsidiary companies in India, Australia, Chile, Guatemala and Russia. Other varieties are available in some of these countries.



‘Catalina.’ Photo from Potato Products International, Ltd.

Meanwhile, if your trial does well and people like the potatoes, you can either consume the crop or save it to grow even more potatoes next year. Experience will soon tell you how many years you can save your own seed tubers before disease builds up and yields drop.

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