Potential Salad Crops for Cultivation

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A number of epidemiological and clinical studies have demonstrated the benefits of vegetables and fruits in the human diet in the prevention of several major diseases including cancer and heart disease. Vegetables and fruits contain chemicals that prevent the occurrence and progression of these major diseases. The National Cancer Institute and the American Heart Association recommend that we **Strive for Five**—five servings of fruits and vegetables a day for a healthier life. The nutritional importance of vegetables has long been recognized. Currently, there is an increased awareness among the general public of the health benefits of the specific chemicals in vegetables and fruits that are sometimes referred to as "nutriceuticals". Among the 13,000 known edible plants, less than 20 are currently being used to provide most of our food needs. Perhaps it's time to broaden our food base and look for alternative and better sources of nutriceuticals.

Watercress is a leafy perennial that grows well at temperatures of 20° to 25°C (68° to 77°F). It is a salad crop commonly used as a pot herb. It is easily propagated by seed, stem or terminal shoot cuttings and requires about 25 to 30 days from seedling transplant to harvest. It contains a chemical, phenethyl isothiocyanate (PEITC), that can prevent cancers caused by carcinogenic nicotine compounds. Watercress is also a rich source of vitamins A and C.

Purslane is an annual succulent that grows well at temperatures of 22° to 27°C (71° to 81°F) and has a high growth rate and water use efficiency. It is a relative of the common spring annual flowering Portulaca and a common prostrate weed in the fields. There are two upright types, a green-leafed type and a golden leafed type that are cultivated as salad greens. All types are propagated easily by seeds, stem or shoot cuttings and take about 20 to 25 days from seedling transplant to harvest. Purslane is an excellent source of the essential omega-3 fatty acid

known as alpha-linolenic acid. The role of this omega-3 fatty acid in normal human growth, development and disease prevention has been well established. Research indicates that omega-3 fatty acids will eventually receive the attention and broad recommendations now given to food fiber.

Although watercress is a common salad crop, its cultivation has declined over time, and purslane is still considered a weed with a nutritive potential. However, it is encouraging to note that purslane is being considered for cultivation by the USDA and is regarded as the Power Food of the Future because of its high omega-3 fatty acid and vitamin E contents.

I am conducting research in the Department of Plant Science, University of Connecticut, under the direction of Dr. R. McAvoy, to identify and characterize the environmental factors (light intensity, day length, temperature, mineral nutrition etc.) that would optimize the nutriceuticals in the edible parts of watercress and purslane.

To date, we have found that leaves of Watercress plants grown in a hydroponic medium containing 200 ppm nitrogen and 128 ppm sulfur contain 84% more PEITC than those grown in a medium containing 200 ppm nitrogen and 64 ppm sulfur. The leaves of plants grown in a medium containing 200 ppm nitrogen and 192 ppm sulfur contain 61% more and 14% less PEITC than the plants grown in 64 and 128 ppm sulfur, respectively. Increasing light intensity one week before harvest increased the PEITC concentration of watercress leaves by ~ 60% in plants grown under a short day length (8 h) compared to those that were grown under continuous low light intensity.

Based on our research, we believe that growing watercress in media containing 200 ppm nitrogen and 128 ppm sulfur and providing supplemental lighting one week before harvest (during winter when the day lengths are short) may enhance the nutritional value of the harvested watercress crop.

In studies with purslane, we have found that plants grown with a nitrate ($N0_3$) to ammonium (NH_4) ratio of 0.5 :0.5 contained about 241% and 53% higher alpha-linolenic acid compared to plants that were grown with NO_3:NH_4 ratios of 1:0 and 0.75:0.25 respectively. Providing the total nitrogen requirement in equal proportions of nitrate and ammonium forms appears to enhance the essential fatty acid content of purslane leaves.

Studies are in progress to identify the environmental conditions and cultural methods that a greenhouse grower can adopt to enhance the nutriceutical content in these salad greens and, thus, add value in terms of health benefits to the consumer.