

# Asian Vegetables

The demand for ethnic vegetables is rapidly increasing in the United States. A large ethnic Asian population and health-conscious American consumer's desire for variety play a major role in boosting the demand for Asian vegetables. Asian vegetables are those that have originated from East Asia (China, Japan and Korea) and Southeast Asia (Indonesia, Laos, the Philippines, Singapore, Thailand, Vietnam, etc.). Asian vegetables are sometimes called "Oriental crops." However, the term Asian vegetables is a more accurate descriptor. Most Asian vegetables are not well-known to American farmers, due to the fact that they are typically cultivated by the Asian growers exclusively for Asian-Americans to use. However, some of these Asian vegetables may be considered as options for Ohio farmers.

## Marketing

In Ohio, agriculture production and acreage statistics are not reported for any of the Asian vegetables. A majority of the U.S. Asian crops production acreage is located in California, Florida and New Jersey. Some production, postharvest handling and marketing information is available from these states but is targeted only for those regions. There is limited research data from other states. Ohio growers may have to rely on their on-farm trials and own experience when they venture into this new arena.

Marketing information for Asian crops is not widely published. Since Asian crops are niche items in the produce marketplace, only specialized produce companies deal in these products. Most of these buyers deal with restaurants, some chain stores, and specialty food stores. Few Asian vegetables are sold through retail farm markets in Ohio. U.S. Department of Agriculture (USDA) market reports are published daily by the fruit and vegetable market news, on produce prices at U.S. terminal markets and terminal markets around the world. Of the Asian crops researched in the field trials in Ohio, wholesale terminal market prices are only reported for Chinese cabbage.

Some of the Asian vegetables could be considered by growers for a double crop situation, i.e., following a wheat or early cabbage or sweet corn crop. Growers who want to diversify their current farming operations by including any of the Asian vegetables need to be very cautious before beginning production. Markets and buyers need to be established before any seeds are purchased. Budgets and further economic data need to be gathered on these crops before profit potential can be determined. All Asian crops are very labor intensive, therefore a strong and dependable labor force will be required for timely harvest and proper cultural management of these crops.

## Common Asian Vegetables

Asian vegetables have different names depending upon the language used. The list below summarizes some of the crops that have performed well in research trials in Ohio. The crop must be identified properly when it comes to marketing the product, as well as when selecting appropriate pest control measures since common names vary depending on the language used (Chinese, Mandarin or Cantonese, Vietnamese, Korean or Japanese, for example). This list is not meant to be complete and should serve as a starting point. Other Asian vegetables can be grown on a trial basis.

**Crucifer or Cabbage Family:** Chinese Cabbage (Napa Cabbage and Bok Choy), and Daikon Radish

**Cucurbit Family:** Bittermelon, Edible Luffa Gourd and Winter Melon

**Legume Family:** Asparagus (Yardlong) Bean, Edible Snap Sugar Peas and Snow Peas

**Solanum Family:** Oriental Eggplant

### **Crucifer or Cabbage Family — Chinese Cabbage (Napa Cabbage and Bok Choy), and Daikon Radish**

**Chinese Cabbage (Napa Cabbage and Bok Choy):** Chinese cabbage has been grown in Asia since the 5th Century. It is now grown primarily in California, New Jersey, Hawaii and Florida. The name Chinese cabbage is applied to a wide range of types and varieties. Following are the main types and varieties of Chinese cabbage.

Group I: Napa Cabbage, *Brassica campestris*, is commonly called pe-tsai group. Its common names also include celery cabbage, Chinese white cabbage, Peking cabbage, pe-tsai, won bok, nappa (Japanese), hakusai (Japanese), pao and hsin pei tsai.

Napa cabbage includes broadleafed, compact-heading varieties of which there are two forms, 'Chihili' and 'Che-foo.'

'Chihili' Type: This form of Napa cabbage forms a cylindrical head 18 inches long and 6 inches in diameter, with an erect, upright growing habit. Some of the varieties of this form are 'Chihili,' 'Michihli,' 'Market Pride,' 'Shantung' and 'Shaho Tsai.'

'Che-foo' Type: This type forms a compact, round head of green-bladed, white petioled leaves. Some varieties in this group are 'Che-foo,' 'Tropical Pride,' and 'Oriental King.'

Group II: Bok Choy, *Brassica campestris* is sometimes called *Brassica chinensis*. The most commonly accepted designations are bok choy or pak choy. Many refer to it as Chinese mustard.

Bok choy is a nonheading form of Chinese cabbage, with several thick white leafstalks. The smooth, glossy, dark green leaf blades form a celery-like cluster. There aren't as many varieties as there are of the napa type. Two are 'Canton Choice,' and 'Long White Petiole.'

Chinese cabbage is a cool season annual vegetable. It grows best with short days and moderate to cool temperatures (60-70 degrees F mean temperature.) Their cultural requirements are similar to those of cabbage and lettuce. Chinese cabbage is fairly quick in maturing. It varies from 40 days from sowing to harvest for some cultivars to 75 days for the longer maturing ones. Space Napa cabbage 18 inches apart and bok choy types 8-12 inches apart and 24 inches between rows.

Daikon Radish, *Raphanus sativus*, var. *longipinnatus*, is also called Chinese radish. This root crop is very closely related to the common radish. The main planting times are spring and fall, but some varieties can be planted almost year-round. Bolting (premature seedstalk) can be a problem. Plant the seeds 3/4 deep in April for a spring crop or July for a fall crop. Plant spacing should be 4-6 inches between plants and 3 feet between rows. To compensate for large root size, plant daikon radishes in high raised beds that are amended with organic matter, such as compost. At each cultivation, work the soil higher and higher around the root as it grows. Most daikon radishes reach their useable size in 60-70 days.

### **Cucurbit Family — Bittermelon, Edible Luffa Gourd, and Winter melon**

Bittermelon, *Mormodica charantia*, is a native of India. Like cucumbers and squashes, bittermelon is a member of the Cucurbit family. It is a warm season vegetable. It is usually grown on a trellis system and its fruit is about the size of a summer squash. The trellis should be 6-foot high and 4-6 feet apart. The seeds can be directly planted or grown as seedlings with spacing at 1.5-2 feet between plants and 3-5 feet between rows. Bittermelons are harvested green before there is any color change. Bright orange fruits are saved for seed collection.

Salt reduces the bitterness. Slice lengthwise and stuff with pork or seafood and top with oyster sauce; or cut halves into 1/4-inch chunks and add to meat/vegetable stir-fries. The young leaves and tips can be steamed.

Edible Luffa Gourds: There are two types of luffa gourds. They are Smooth Luffa and Angled Luffa.

Smooth luffa, *Luffa cylindrica*, originated in India and was later taken to China. If left to mature on the plant, the smooth luffa gourd produces the familiar "Luffa sponge" that is found in stores. This luffa sponge can be used as a dishrag or great back-scrubber. Soak the light brown mature gourd in 10% bleach for 24 hours, then peel off the skin and allow to dry. The plants need to be trellised. This is a warm season vegetable. The smooth luffa is mainly grown for the young squash-like fruits. Slice Luffa into 1-inch pieces and stir-fry with shrimp in a tempura batter and cooked in oyster sauce; or simply stir-fry in butter by itself or with other vegetables. Be careful not to overcook as it will become mushy. Some of the luffa cultivars are 'Smooth Boy,' 'Smooth Beauty,' and 'Southern Winner.'

Angled Luffa, *Luffa actuangula*, is very similar to the smooth luffa except that the actuangula seems somewhat more susceptible to spider mite attacks. Luffa gourds are trained on trellises to encourage straighter fruits, which can become more curved if allowed to grow on the ground. Just like smooth luffa, the angled luffa is a warm season annual vegetable.

The quality of this squash as a sponge gourd is not as desirable; however, in stir fries and other foods it excels and does not become mushy as readily. It is sweeter and has a better flavor than zucchini. This type should be peeled, as the ridges are fairly hard. Most plantings will have both types of luffa for the varied tastes of consumers, but the popularity of angled luffa predominates. Some of the angled luffa cultivars are 'Hybrid Green Glory,' 'Hybrid Asian Pride,' 'Lucky Boy' and 'Summer Long.'

Winter Melon, *Benincasa hispida*, can be quite big and usually weighs in excess of 30 pounds. Winter melons are harvested when mature and have developed the white wax bloom on the skin. Because of its size, it is not trellised but allowed to spread over the ground. Its grows very similarly to pumpkins.

Winter melon can be stored for 3 to 4 months over the wintertime, much like winter squash. The flavor of winter melon is very mild. The flesh or rind is white and is a main ingredient in chicken soup with other vegetables. It can be stir-fried with pork and onions.

### **Legume Family — Asparagus (Yard Long) Bean or Chinese Long Beans, and Edible Pod Sugar Peas and Snow Peas**

Asparagus (Yardlong) bean or Chinese long beans, *Vigna sesquipedalis*, is a long trailing vine that should be grown on trellises. This plant is more closely related to black-eyed pea than to the common green snap bean. Dark and light green varieties are available as well as a red type. The darker varieties are generally preferred. It is a warm season vegetable. Yardlong beans are cut into 2-inch pieces and added to various stir-fries. The paler green is sweeter and more tender than the dark green.

Sugar Snap Pea and Snow Pea, *Pisum sativum*, are cool season vegetables of the Legume family. Seeds should be sowed in April for a spring crop or sowed in July for a fall crop. Plants deteriorate quickly in the heat of summer. The plants of sugar snap pea and snow pea grow similarly to bush beans. It is often helpful to grow them on trellis to facilitate the picking; however, if grown for the tender shoot tips, they are usually left un-trellised.

Both the pods and seeds are edible and are essential in oriental dishes. They are also used in soups, beef and other meat dishes, and stir fry. Snow peas are flat and should be trimmed at both ends. Snap peas are more filled out and do not require trimming. The tender tips can be boiled like spinach or added fresh to a green salad.

## **Solanum Family — Oriental Eggplants (Asian Eggplants)**

Oriental eggplants, *Solanum melongena*, are native to tropical Asia and are very popular in Japan, China, India, Thailand and the Philippines. Many varieties are available. They can be light or dark purple, brown or green in skin color; round and slender in shape.

Eggplants require full sun and well-drained soil. Eggplants must have warm soil to grow well and they take a long time to reach maturity. Hence, it is a good idea to start seedlings in a greenhouse and set the transplants in the field after the danger of frost is over. Transplant eggplants 18-24 inches apart in rows 30-36 inches apart between rows. Eggplants grow best in hot weather. Water the plants during the dry spells. Harvest usually begins in mid to late summer, about 70-90 days after sowing the seeds. Harvest eggplants when the fruit reaches the right size and when skin is glossy and firm. Fruit sizes vary depend on the variety.

## **Pest Management, Disease and Weed Control**

Many of Asian vegetables belong to a wide range of plant families including legumes, cole crops, cucurbits and others. Pest management strategies developed for other crops in Ohio may be helpful in these crops, since many pests and diseases are similar. There are also new and unique problems associated with these crops, and the selection of pest and weed control products available is limited. Alternative methods of weed control will have to be considered, including cultivation, hand hoeing and the use of mulching materials, since very few chemical herbicides are labeled for these crops.

Growers should ensure that seed purchased is certified disease-free or within acceptable guidelines. Many diseases that affect Asian crops can be seed-borne. Treatment of seed may also reduce the incidence of seed-borne disease (see Seed Treatments, page 24).

Crop rotation of at least 3 years is recommended. Avoid working in the field when the crop is wet to avoid the possibility of spreading bacterial diseases. Use disease-resistant varieties when they are available. Control virus disease vectors such as aphids. Control and remove weeds that can be hosts for viral diseases.

### **For Bok Choy, Broccoliraab, Cavalobroccoli, and Chinese Broccoli**

**Clopyr Ag:** For control of sensitive annual, biennial and perennial broadleaf weeds apply 1/4 to 1/2 pint/A when weeds are actively growing. Two applications are permissible with no more than 1 pint/A applied for the growing season (30 days-PHI).

## **Lime and Fertilizer**

Because Asian crops consist of a wide range of non-traditional crop types, a single fertilizer recommendation cannot be made; however, a fertility and liming program based on a soil test can form the basis of a good crop fertility program. Most crops will require a correct balance of nitrogen, phosphorus and potassium as well as an understanding of the individual crop's requirement and response to micronutrients (B, Zn, Mg, Mn, Cu, Mo, Ca, etc.). Experience of fertility requirements of traditional Ohio vegetable crops will be helpful when determining a program for these Asian crops.

## **Useful References**

*Speciality and Minor Crops Handbook*, 1998. Second Edition. University of California, Division of Agriculture and Natural Resources, Publication 3346.

*Manual of Minor Vegetables* by James M. Stephens, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences.

## **Helpful Web Sites**

[http://www.sfc.ucdavis.edu/research/AsianVeg/asian\\_veg.htm](http://www.sfc.ucdavis.edu/research/AsianVeg/asian_veg.htm)

<http://www.uky.edu/Ag/NewCrops/introsheets/asian.pdf>

<http://www.hort.purdue.edu/newcrop/proceedings1996/v3-488.html>

<http://www.hort.purdue.edu/newcrop/proceedings1990/V1-387.html>

## Insecticides for Asian Vegetables

Insecticide Product	Target pest <sup>a</sup>	Minimum number of days between last application and harvest							
		Bok choy & other leafy Brassica in sub-group 5B	Napa & other head ing Brassica in sub-group 5A	Chinese spinach & other leafy greens in sub-group 4A	Chinese celery & other leaf petioles in sub-group 4B	Oriental radish & other root crops in sub-group 1A	Chinese artichoke & other tuber/corm in sub-group 1C	Chinese wax-gourd & other squash in sub-group 9B	Citron-melon & other melons in sub-group 9A
<b>ORGANO-PHOSPHATES</b>									
Diazinon	A, C, LM	10	10	-	-	-	-	-	-
Dibrom	A, C	-	1	-	-	-	-	-	-
Lorsban	RM	30 <sup>b</sup>	30 <sup>b</sup>	-	-	-	-	-	-
Malathion	A, BE, C	7	7	7	-	-	-	-	-
MSR	A, T	-	7	-	-	-	-	-	-
<b>CARBAMATES</b>									
Lannate	C	10 <sup>b</sup>	10 <sup>b</sup>	-	-	-	-	1; 3	1; 3
Larvin	BE, C	-	-	14	14	-	-	-	-
Sevin	BE, C, BU	14 <sup>b</sup>	14 <sup>b</sup>	-	-	-	-	-	-
<b>PYRETHROIDS</b>									
Ammo	BE, C, T, BU	1	1	-	-	-	-	-	-
Asana	BE, C	-	3	-	-	-	-	-	-
Baythroid	BE, C, T, BU	-	0	-	0	-	0	0	0
Capture	BE, C, T, BU, W	7	7	-	-	-	21	3	3
Danitol	C	-	7	-	-	-	-	7	7
Decis	C, BE, BU	-	-	-	-	3	3	3	3
Hero	C, BE, T	-	7	-	-	-	-	-	-
Mustang Max	BE, C, T, BU	1	1	1	1	1	1	1	1
Permethrin	BE, C, T, BU	-	1	1	1	-	-	0	0
Proaxis	BE, C, BU	-	1	-	-	-	-	-	-
Warrior	BE, C, BU	-	1	-	-	-	-	-	-
<b>NEONICOTINOIDS</b>									
Actara	A, BE, W	7	0	-	-	7	14	0	0
Admire	A, W, T, BE	21	21	21	45	21	3; 125	21	21
Assail	A, BU, BE, C	7	7	-	7	-	-	0	0
Platinum	A, BE, W	30	30	-	-	✓	-	30	30
Provado	A, W, BE	7	7	7	-	-	7	-	-
Venom	A, W, LM, T	-	1; 21	7; 21	7; 21	-	-	1; 21	1; 21
<b>OTHER NERVE POISONS</b>									
Agri-Mek, Abba	M, LM	-	-	7	-	-	-	7	7
Avaunt	C	3	3	-	3	-	-	-	-
Beleaf	A	-	0	0	0	-	-	0	0
Fulfill	A, W	7	7	-	7	-	14	0	0
Proclaim	C	7	7	-	-	-	-	-	-
Pyrethrins + PBO	A, C, BE, BU, T	0	0	0	0	0	0	0	0
Radiant	C, T, LM	1	1	-	-	3	7	3	3
SpinTor	C, LM, T	1	1	-	-	-	7	3	3

<sup>a</sup>A = aphids; BE = beetles; BU = bugs; C = caterpillars; LM = leafminers; M = mites; RM = root maggot; T = thrips; WF = whiteflies.

<sup>b</sup>Approved for use on Chinese cabbage, type not specified; not approved for other crops in crop group.

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<b>INSECT GROWTH REGULATORS</b>									
Confirm	C	7	7	7	7	-	-	-	-
Esteem	W	7	7	-	-	-	-	7	7
Intrepid	C	1	1	1	1	14	-	3	3
Neemix & others	C, LM, A, W	0	0	0	0	0	0	0	0
Rimon	C, LM	-	7	-	-	-	-	-	-
Trigard	LM	7	-	-	-	-	-	0	0
<b>MISCELLANEOUS</b>									
Brigadier	C, A, T	7	7	-	-	-	21	-	-
Coragen	C	3	3	1	1	-	-	1	1
DiPel (B.T.)	C	0	0	0	0	0	0	0	0
Durivo	A, C, T	30	30	-	-	-	-	30	30
FujiMite	M, WF	-	-	-	-	-	-	-	3
Leverage	C, BE, A	7	7	7	-	7	7	-	-
Movento	A, WF	-	-	3	3	-	7	-	-
Mycotrol-O	W, BE, A	0	0	0	0	0	0	0	0
Oberon	M, W	7	7	7	7	-	7	7	7
Soap	A, M, W, T	0	0	0	0	0	0	0	0
Synapse	C	1	1	1	1	-	-	1	1
Voliam Flexi	C, A, BE, T	7	3	-	7	-	-	1	1
Voliam Xpress	C, BE	-	3	-	-	-	-	1	1
Zeal	M	-	-	-	-	-	-	-	7

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<sup>b</sup>Approved for use on Chinese cabbage, type not specified; not approved for other crops in crop group.

## Nomenclature

The crops of Asian origin have different names depending upon the language used. The list below summarizes some of the crops that have performed well in research trials in Ohio. The crop must be identified properly when it comes to marketing the product, as well as when selecting appropriate pest control measures since common names vary depending on the language used (Chinese, Mandarin or Cantonese, Vietnamese, Korean, or Japanese, for example).

1. Mustard Spinach
2. Daikon Radish
3. Asparagus (Yard Long) Bean
4. Napa Cabbage
5. Thick Petiole White Chinese Leaf Cabbage
6. Red or Green Mustard (Mizuna)
7. Thin Petiole White Chinese Leaf Cabbage
8. Bitter Melon
9. Winter Melon
10. Japanese Greens
11. Chinese Cabbage
12. Oriental Eggplant
13. Edible Luffa Gourd