

Chinese Mustard Cultivation Guide for Florida¹

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General Description

Chinese mustard (*Brassica juncea* (L.) Czern) is a nutritious leafy vegetable in the family Brassicaceae. The nomenclature for Chinese mustard is diverse; there are various Latin binomials with synonyms including *Brassica japonica* (Thunb.) Siebold ex Miq. (CABI 2019, Fern 2020). Chinese mustard also goes by many common names, such as brown mustard, mustard greens, leaf mustard, Indian mustard, Oriental mustard, and vegetable mustard (<https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomydetail?id=7654>, CABI 2019, Cornell 2006, Fern 2020, Purdue 2020). The origin of Chinese mustard is likely Central Asia with subsequent migrations to India and China (CABI 2019, Chen et al. 2013). Chinese mustard is widely distributed in areas where annual mean temperature is greater than 43°F, and it has been introduced to all 50 US states (CABI 2019, USDA-NRCS 2020). Although it is considered a weed in a few states, such as Michigan, this species is not listed as invasive in Florida and has been cultivated in several counties, including Levy, Palm Beach, and Miami-Dade (USDA-NRCS 2020).

Botanical Description

Chinese mustard is a perennial herb, but growers often cultivate the plant as an annual or biennial (CABI 2019, Fern 2020, Purdue 2020). This plant can grow up to 2 to 3 feet tall (CABI 2019, Cornell 2006), with erect stems and branches (CABI 2019, Fern 2020, Purdue 2020) (Figure 1, Figure 2). The green-to-purple leaves have flat veins and

an ovate shape with toothed margins, and the marketable size of a plant leaf is usually measured at least 6 inches in both length and width (CABI 2019, NCSU Extension 2020, Purdue 2020) (Figure 3). Each flower has typically four petals, creating a cruciform, or cross-like, shape (Castner 2004, NCSU Extension 2020). The petals are small, 0.25 to 0.5 inches in length and 0.2 to 0.3 inches in width, and usually have an ovate shape with a narrow basal claw and yellow color (CABI 2019, Castner 2004). Roots of Chinese mustard plant can reach 3 to 4 feet deep (Purdue 2020).



Figure 1. Chinese mustard 'Red Giant' (purple) (*Brassica juncea* (L.) Czern) interplanted with collard greens (green) (*Brassica oleracea* var. *viridis* L.).

Credits: Mary Dixon, UF/IFAS

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Figure 2. Chinese mustard 'Red Giant' (purple) (*Brassica juncea* (L.) Czern) interplanted with collard greens (green) (*Brassica oleracea* var. *viridis* L.).
Credits: Mary Dixon, UF/IFAS



Figure 3. Chinese mustard (*Brassica juncea* (L.) Czern) marketable leaves.
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Propagation

Chinese mustard seeds are tiny, globose-shaped, and usually brown or yellow in color (CABI 2019). Seeds may be sown a quarter to a half inch deep and spaced 4 to 8 inches between adjacent plants in rows 12 to 16 inches apart (Anderson 2011, Brown et al. 2018, Drost and Johnson 2020). Chinese mustard is a cool-season vegetable crop, and it requires 3 to 7 days to emerge after seeding (Masabni 2014). Plant germination will stagnate if the temperature is higher than 85°F or lower than 40°F (Cornell 2006, Drost and Johnson 2020). The planting date of Chinese mustard in Florida depends on location (Brown et al. 2018) (Table 1).

Cultivation Practices

Chinese mustard grows optimally in full-sun conditions (Anderson 2011, Cornell 2006), but partial shade may be beneficial for the crop during warm weather (Cornell 2006). Varieties recommended for Florida cultivation include 'Southern Giant Curled' and 'Florida Broad Leaf' (UF/IFAS Master Gardener Program 2020).

Chinese mustard requires consistent moisture through irrigation, especially during dry periods, to prevent slow development and off flavors (Cornell 2006, Drost and Johnson 2020). This vegetable can tolerate mean annual rainfall up to 160 inches (CABI 2019, Fern 2020, Anderson 2011, UIUC Extension 2020). When temperature is higher than 85°F, Chinese mustard might bolt quickly and develop leaf bitterness due to the lack of moisture (Cornell 2006, MSU Extension 2020).

Chinese mustard grows optimally in well-drained fertile soils with a pH of 6.0 to 7.5 (Cornell 2006, Fern 2020). The crop can tolerate slightly acidic and alkaline soil (Cornell 2006, Purdue 2020). The UF/IFAS recommendations of NPK are available for mustard but not Chinese mustard grown in Florida. Because Chinese mustard and mustard belong to the same family, growers can employ the current mustard recommendations for Chinese mustard: 120 lb/ac of N, and 0, 100, or 120–150 lb/ac of either P₂O₅ or K₂O for high, medium, and low soil test indices with the Mehlich-3 soil extractant method. Please see *Chapter 2. Fertilizer Management for Vegetable Production in Florida in the Vegetable Production Handbook of Florida* (available at <https://edis.ifas.ufl.edu/cv296>, Liu et al. 2020).

Pests and Diseases

Chinese mustard has relatively high resistance to pests and diseases compared to other cole crops, such as cabbage and cauliflower (Cornell 2006). However, there are still several pests that might cause deleterious effects to the crop. Therefore, an integrated pest management approach is critical to successful Chinese mustard production. For chemical control recommendations, please see *Chapter 6. Cole Crop Production in the Vegetable Production Handbook of Florida* (available at <https://edis.ifas.ufl.edu/cv122>).

For overarching pest and disease control, remove infected plants immediately to prevent spread (Smith 2007). Also, floating row covers can help minimize early-season infestation (Cornell 2006). Chinese mustard is host to pests including aphids (*Aphis* spp.), flea beetles (*Altica* spp.), and whiteflies (*Aleyrodidae* spp.) (Anderson 2011, Cornell 2006). Intercropping with alyssum (*Lobularia maritima* (L.))

Desv.) effectively controls aphid and whitefly populations in other cole crops such as broccoli (*Brassica oleracea* L. var. *italica* Plenck) (Brennan 2016) and collard greens (*Brassica oleracea* L. var. *acephala*) (Ribeiro and Gontijo 2017) by attracting hoverflies, a natural aphid predator, and coccinellids, a natural whitefly predator. Botanical extracts of *Zingiber officinale* at 25% w/v has been shown to reduce incidence of flea beetle damage in cole crops such as cabbage (*Brassica oleracea* L. var. *sabauda*) (Foluke 2017). Several cabbage worms, such as imported cabbageworms (*Pieris rapae* L.), cabbage loopers (*Trichoplusia ni* Hübner), and diamondback moth worms (*Plutella xylostella* L.), can also pose a threat to the plant by attacking the leaves (UIUC Extension 2020). Bioinsecticides utilizing the entomopathogenic fungi *Beauveria bassiana* have been shown to control cabbageworm populations in cabbage (Garcia-Gutierrez et al. 2009).

Chinese mustard may be susceptible to diseases, particularly downy mildew (*Hyaloperonospora parasitica* (Pers.) Constant), which results in a misshapen leaf with yellow blotches (Smith 2007, UIUC Extension 2020). Seed treatment and later foliar spray of *Allium sativum* bulb extract at 1% w/v may reduce the severity and incidence of downy mildew, Alternaria leaf blight (*Alternaria brassicae* (Berk.) Sacc.), white rust (*Albugo candida* (Pers. Ex Lev.) Kuntze), Sclerotinia rot (*Sclerotinia sclerotiorum* (Lib.) de Bary), and powdery mildew (*Erysiphe cruciferarum* Opiz ex L. Junell) on Chinese mustard (Meena et al. 2013).

Harvest and Storage

Chinese mustard grows fast, and recommended varieties such as ‘South Giant Curled’, and ‘Florida Broad Leaf’ usually reach harvest maturity 45 to 50 days after planting (Cornell 2006). This crop can be harvested by either cutting the entire plant or picking off the fully expanded leaves (Anderson 2011, MSU Extension 2020, UIUC Extension 2020). For successive harvesting, cutting off only the plant crowns allows plants to regrow for a second harvest (MSU Extension 2020). While harvesting, avoid unmarketable dead, yellowing, and overmatured leaves (UIUC Extension 2020). Because cloudy weather might decrease leaf vitamin C and mineral nutrients, it is recommended to harvest the plant during the period of high light intensity within a short time period (Makus and Lester 2004). Fresh Chinese mustard can be stored in the refrigerator for three days when put in plastic bags (UIUC Extension 2020). Plants may be stored up to five days if leaves are wrapped in moist paper towels (UIUC Extension 2020). Chinese mustard can stay fresh for 12 days if stored in vacuum bags at temperatures

of 34°F–38°F but will quickly decay if temperature rises above 59°F (Bracy 1990).

Uses

Chinese mustard leaves can be either eaten raw, in salad mixes, stir-fried, or braised with ham, pork, or turkey (Purdue 2020, UIUC Extension 2020) (Figure 4). This vegetable is nutritious and rich in vitamins (e.g., vitamins A, C, and K), carotene, and minerals (e.g., Ca and K) (Table 2) (UIUC Extension 2020). Chinese mustard can also be cultivated as an oil-yielding crop; its seeds contain 30% to 45% oil and are a primary source for canola oil (CABI 2019, Purdue 2020).

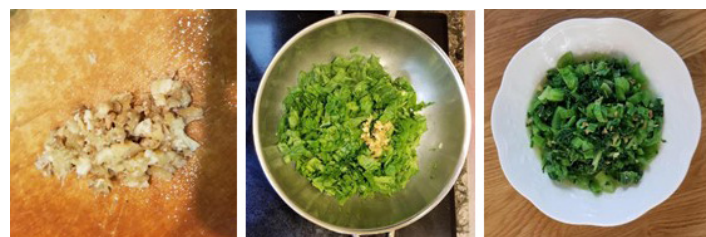


Figure 4. Chinese mustard (*Brassica juncea* (L.) Czern) and finely chopped ginger root served in soup (left), in salad mixes (middle), and stir-fried with oil (right).

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Because Chinese mustard is a good source of antioxidants such as beta carotene and vitamin C (Table 2) (USDA-ARS 2019), consumption may help protect against free radicals and oxidative-related diseases (Frazie et al. 2017, Lin and Harnly 2010, Pham-Huy et al. 2008). Also, Chinese mustard might be good for the immune system due to high vitamin A and C concentrations (Carr and Maggini 2017, Huang et al. 2018). Being rich in vitamin K makes this vegetable good for bone health as well (DiNicolantonio et al. 2015). Chinese mustard is beneficial for heart and eye health due to the presence of flavonoids, beta carotene (Ciccone et al. 2013, Rees et al. 2018), lutein, and zeaxanthin (Buscemi et al. 2018, Jia et al. 2017). In addition, this plant contains glucosinolates, which are effective in the treatment of microbial infection and fighting against cancer (Becker and Juvik 2016, Frazie et al. 2017, Melrose 2019) (Table 2).

Chinese mustard has potential to treat heavy metal pollution by phytoremediation (CABI 2019); it has been found to significantly decrease the level of cadmium, copper, lead, and zinc in soil (Bauddh and Singh 2011, Lim et al. 2004, Salido et al. 2010, Singh and Fulekar 2012, Turan and Esringü 2007). Also, Chinese mustard is a good biological control agent for pathogenic nematodes (*Globodera pallida*) because it significantly reduces nematode reproduction (Ngala et al. 2015, Zasada and Ferris 2004), which may make this crop a good candidate for crop rotation. Chinese

mustard is rich in glucosinolates; incorporating residuals may have an effect as a biofumigant to control soilborne issues and decrease nematode population (Henderson et al. 2009, Salem and Mahdy 2015).

Marketability and Future Outlook

Chinese mustard has been widely cultivated in the United States due to its high nutritional and medicinal values (USDA-NRCS 2020). According to the University of Kentucky Cooperative Extension Service and University of Arkansas Cooperative Extension Service, the estimated expenses for growing Chinese mustard would be \$3,000 to \$3,500 per acre (Kaiser and Ernst 2017, Sanders 2015), which generates an approximate \$1,000 to \$1,500 profit (Sanders 2015). Leafy greens that are used in salads and sandwiches are consumed daily by many US consumers, and many are motivated to try other nontraditional leafy vegetables (Kaiser and Ernst 2017). Chinese mustard offers many advantages, such as a distinct peppery and nutty flavor often preferred by consumers, in addition to a high nutritional value (UF/IFAS Gardening Solutions 2020). If marketed properly, Chinese mustard could be a new cash crop in Florida.

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Table 1. Florida outdoor planting dates for Chinese mustard. Source: <https://edis.ifas.ufl.edu/vh021>

Crop	Florida Outdoor Planting Date		
	North (of State Road 40)	Central (between State Road 40 and 70)	South (of State Road 70)
Chinese Mustard	August–February	September–February	September–January

Table 2. Nutritional value of Chinese mustard (*Brassica juncea* (L.) Czern.), raw, per 100 g. Source: USDA-ARS, National Nutrient Database available at: <https://fdc.nal.usda.gov/fdc-app.html#/food-details/169256/nutrients>

Name	Amount	Unit
Variables		
Water	90.7	g
Energy	27	kcal
Energy	114	kJ
Protein	2.86	g
Total lipid (fat)	0.42	g
Ash	1.36	g
Carbohydrate, by difference	4.67	g
Fiber, total dietary	3.2	g
Sugars, total including NLEA	1.32	g
Minerals		
Calcium, Ca	115	mg
Copper, Cu	0.165	mg
Iron, Fe	1.64	mg
Magnesium, Mg	32	mg
Phosphorus, P	58	mg
Potassium, K	384	mg
Selenium, Se	0.9	µg
Sodium, Na	20	mg
Zinc, Zn	0.25	mg
Vitamins		
Vitamin A, IU	3024	IU
Vitamin A, RAE	151	µg
Vitamin B-6	0.18	mg
Vitamin B-12	0	µg
Vitamin B-12, added	0	µg
Vitamin C, total ascorbic acid	70	mg
Vitamin D (D2 + D3)	0	µg
Vitamin D (D2 + D3), International Units	0	IU
Vitamin E (alpha-tocopherol)	2.01	mg
Vitamin E, added	0	mg
Vitamin K (phylloquinone)	257.5	µg
Folate, total	12	µg
Folic acid	0	µg
Folate, food	12	µg
Folate, DFE	12	µg
Carotene, alpha	10	µg
Carotene, beta	1790	µg
Choline, total	0.5	mg

Name	Amount	Unit
Cryptoxanthin, beta	40	µg
Lycopene	0	µg
Lutein + zeaxanthin	3730	µg
Niacin	0.8	mg
Pantothenic acid	0.21	mg
Retinol	0	µg
Riboflavin	0.11	mg
Thiamin	0.08	mg
Lipids		
Cholesterol	0	mg
Fatty acids, total saturated	0.01	g
Fatty acids, total monounsaturated	0.092	g
Fatty acids, total polyunsaturated	0.038	g
Fatty acids, total trans	0	g
Others		
Alcohol, ethyl	0	g
Caffeine	0	mg
Theobromine	0	mg