Optimize your Asian Greens Production

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Characteristics of Our Favorites:

- ✓ Napa cabbage, 52d, used as heads. Stores better than michihili types.
- ✓ Michihili, 72d, used as heads. More stress tolerant and resistant to bolting and black speck than Napa cabbage,
- ✓ Tokyo Bekana, 21d baby leaf, 45d full size. Loose leaf heads, frilly, yellow-green. Mild flavor, sub for lettuce.
- ✓ Maruba Santoh, 21d baby leaf, 35d full size. Similar to Tokyo Bekana but less frilly. Fairly bolt tolerant.
- ✓ Pak choy/bok choi, (Chinese mustard cabbage) 45-55d to maturity. Thick white or green stems. Mainly used as heads, although can be picked as individual young leaves. Also in purple.
- ✓ Mizuna (kyona), 21d to baby salad, 40d maturity. Mild, frilly, grows abundantly, cut leaves. Warm- and cold-tolerant.
- ✓ Ruby Streaks, Golden Frills, Scarlet Frills, Red Rain *(Brassica juncea,* not the same as mizuna*)* 21d baby, 40d full-size.
- ✓ Tatsoi (tah tsoi), 21d baby salad, 45d maturity. Smallish, flatish rosette of shiny, dark green spoon-shaped leaves.
- ✓ Komatsuna (mustard spinach, Summer Fest), 21d baby salad, 35d maturity. Tall plant, big leaves. Can bunch.
- ✓ Yukina Savoy, 21d baby size, 45d maturity. Like tatsoi, but 12" (30 cm) tall. More cold-hardy, bolt-resistant than *Koji*
- ✓ Koji, 21d baby leaf, 43d to maturity.
- ✓ Senposai, (cross between komatsuna and regular cabbage), 40d to maturity. Big plant with large, round, mid-green leaves. Usually harvested leaf by leaf. Very productive, grows fast, cooks quickly. Can also harvest as baby leaf.
- ✓ Wild Garden Pungent Mix, A cross of pungent *juncea* mustards for those who like Big Flavor. 40 days to harvest.
- ✓ Pink Petiole Mix, Fast-growing, cold tolerant. A varied mix of colors and shapes. Ready in 40 days.
- ✓ Ornamental and garnish kales and cabbages add color and texture. (Nagoya Red, Nagoya White, Red Chidori)
- ✓ Winter Radish, including Daikon. Sow in late summer

Other Small Asian Greens:

- Hon Tsai Tai (Choy Sum), 35-40 days to shoots. Like a purple broccoli raab, mostly stem with small clusters of buds.
- Mei Qing Choi, a miniature 6" (15 cm) pak choy. It matures in less than 45 days.
- Vitamin Green (Yokatta-Na, Bitamin-Na), 21 days for salad mix, 45 to its full size. Slender, white-stemmed plant, about 12" (30 cm) tall. It can be planted 4" (10 cm) apart, or direct sown and thinned.

Other Big Asian Greens:

- Tyfon Holland Greens (cross of komatsuna and a heading brassica, an industrial strength plant.
- Mizspoona, (mizuna x tatsoi), large sturdy plant, 40d to maturity. Sweet flavor with a good balance of mild zinginess.
- Tenderleaf, big, sturdy OP. Quick-cooking, mild-flavored, despite appearances. Useful baby salad mix crop.
- Toraziroh, 45d, robust, high yielding, large leaves with a good, not overpowering flavor. Relatively slow to bolt.
- Mustard greens, Chinese Mustards such as Red Giant and Osaka Purple, Chinese Thick-Stem Mustard and American Mustards (Southern Green Wave). Attractive colors. 21d baby leaves, 40–45d full size

Asian Non-brassica Greens:

- Chrysanthemum greens/shungiku, *Chrysanthemum coronarium*. 21d baby greens, 45d to full size. A *very* distinctive aromatic flavor

Crop Requirements for Asian Greens (similar to other brassicas)

- ❖ Closely monitor pests, which can build up large populations during the summer.
- ❖ Very fertile soils grow the best Asian greens, use legume cover crops or compost to provide adequate nutrition.
- ❖ Shallow-rooted - provide enough water during hot weather to prevent bitter flavors and excess pungency. 1" (2.5 cm) of water per week, 2" (5 cm) during very hot weather. Drip irrigation saves water and reduces disease and weed pressure. Overhead irrigation is cheaper, easier to set up and can wash off aphids - all the control you need?
- ❖ We grow a lot of brassicas and our crop rotation is always pushed and stretched by the amount of brassicas we'd like to plant – transplanting allows the soil a few extra weeks without brassicas.
- ❖ Transplanting gives the previous crop extra time - If we have 4 weeks between the end of one crop and transplants going in, we sow buckwheat to add organic matter and smother weeds. We usually choose this cover crop opportunity rather than direct sow greens.

In Spring the season for Asian greens is short – they will bolt

- Sow in flats in a greenhouse, to get an early start, and transplant at 4–5 weeks of age, about a month before the last frost date. Use rowcover for a few weeks.
- On the other hand, direct sowing has the advantage that thinnings can be used for salads.

In Summer Tokyo bekana or Maruba Santoh as lettuce substitutes. Full size in 35 days from sowing in warm weather.

Season Extension in Hot Weather – Use shadecloth and netting to keep crops cool and keep pests off, Keep watered. Asian greens have no problem germinating in temperatures up to 95F (35C). ProtekNet Pest Control Netting is made of clear high-density polyethylene with UV resistance and a lifespan of eight to ten years. Its light transmission is 90 percent. From Purple Mountain Organics in Maryland, duboisag.com and other suppliers. Net is better than rowcover in hot weather, as airflow is better and it heats less. Choose the appropriate size mesh for the pest you are excluding.

In Summer for Fall Outdoor Crops

- We prefer outdoor seedbeds for summer sowings, over flats, because it is easier to keep the plants watered. We make an outdoor nursery bed, sow at 3-4 seeds per inch (5–10 mm apart), and cover with rowcover or ProtekNet.
- The seedlings emerge in as little as three days in summer temperatures.
- We start sowing our fall Asian greens for outdoor growing around June 26 and repeat a week later for insurance (July 3) - the same dates we sow fall broccoli and cabbage.
- Last date for sowing these crops is about 3 months before the first fall frost date. In our case that means July 14–20.
- Faster growing types (Napa cabbage, Tokyo Bekana, Maruba Santoh) are ready to transplant 2 weeks after sowing.
- Others transplant best at 3–4 weeks of age. We transplant outdoors from July 10 to July 31.
- To minimize transplant shock, water the plants well an hour before transplanting, get them in the ground as quickly as possible and water again. Shadecloth or rowcover will help keep breezes and strong sun off the plants.

Cold-Hardiness

- 32F (0C): Some Pak Choy
- 25F (-4C): Chinese Napa cabbage, Maruba Santoh, Mizuna, most Pak Choy, Red Giant Mustard, Tokyo Bekana,
- 20F (-7C): Tendergreen, Tenderleaf, Tyfon Holland Greens
- 15F (-9.5C): perhaps Komatsuna
- 12F (-11C): Senposai (may be OK down to 10F (-12C)
- 10F (-12C): Green-in-Snow mustard, probably Komatsuna; Tatsoi, Yukina Savoy, winter radishes
- 6F (-14C): Thick-stemmed Mustard

Spring Bolt Resistance

In spring the order of bolting of Asian greens is: tatsoi, Maruba Santoh, Tokyo bekana, Koji, Napa cabbage, pak choy, Yukina Savoy, Komatsuna, mizuna, leaf radish.

Season Extension in Cold Weather

- Rowcovers on hoops will help keep these crops marketable, by improving the microclimate for better growth rate.
- Consider Quick Hoops and caterpillar tunnels if they suit your climate and crops.
- Fast growing varieties can be succession sowed in late summer and fall for a continuous supply.
- Wild Garden Seeds and Gathering Together Farm specialize in producing seed of very cold-tolerant varieties. Cold hardy types can be harvested all winter in milder climates, or they can be kept alive to revive in spring and provide earlier harvests than spring-sown crops.

Asian Greens in the Winter Hoophouse

- ✓ Night-time protection of two layers of plastic and an air gap makes a big difference.
- ✓ September sowings thrive on sunny days and grow at a surprisingly fast rate.
- ✓ Brassicas are *the most* productive crops in these conditions

- ✓ On very cold winter nights (below 8F (-13C) outdoors), we use thick rowcover – Dupont Xavan 5131 (aka Typar). 1.25 oz/sq yd spunbonded polypropylene; 75% light transmission; about 6 F (3.3 C) degrees of frost protection.

Persephone Days

- ➢ When the daylight falls below ten hours, little growth will happen till spring.
- ➢ The dates depend on your latitude. At 38° N, (where Twin Oaks is) it's November 20–January 20.
- ➢ The dates are modified by the time it takes to cool the soil and the air, as winter bites.
- ➢ In practice, the effective dates for us may be closer to December 15–February 15.

Fall Hoophouse Planting

- ❖ Direct sowings, and transplants from outside in the fall, or grown inside and transplanted during the winter.
- ❖ September 7: We clear and add compost to one of the beds inside to sow *Tatsoi* .
- ❖ Sept 15 and Sept 24: We make outdoor sowings of crops to transplant into the hoophouse at 2–4 weeks old. We cover this outside nursery bed with hoops and rowcover to keep bugs off, and water it frequently. This method gives us cooler conditions for better seed germination, and gives our summer hoophouse crops longer.
- ❖ The Sept 15 sowing includes *Pak choy,* Chinese cabbage, *Yukina Savoy, Tokyo Bekana* and *Maruba Santoh*.
- ❖ The Sept 24 sowing includes *Senposai*, more *Yukina Savoy*, mizuna and other frilly mustards, and resows of anything from the previous week that didn't give a good stand of seedlings.
- ❖ By the end of September we clear the summer crops from at least one more bed, and work in some compost. We transplant *Tokyo Bekana, Maruba Santoh*, *Pak choy*, Chinese cabbage at 2 weeks old; *Yukina Savoy* at 3 weeks.
- ❖ In the fourth week of October, we clear and prepare more beds and transplant the *Senposai*, mizuna, 4-5 weeks old.

In the Hoophouse During the Winter

- Nov 10 we sow more mizuna and Frilly Mustards. Nov 11-20 we sow more tatsoi
- From Nov 10 on we aim to keep a fully planted hoophouse, and as each crop harvest winds down, we immediately replace that crop with another.
- During December we use the Filler Greens plants to replace casualties and heads of Chinese cabbage, Pak choy, Yukina Savoy each day as soon as we've harvested them.
- At the end of January, we clear the first mizuna, sow radishes; clear some Tokyo Bekana, Yukina savoy #1 on south edge, sow lettuce mix 2/2. See complete list of Follow On Crops later.
- Feb 1 we sow Frills #3
- We stop filling gaps with Asian greens (and lettuces) on Jan 25, and fill all gaps after that with spinach transplants, until 2/20. After that we only fill gaps on edges of beds, leave centers free for tomatoes, etc.
- After 2/20, we harvest the winter crops from the center rows first, plant the new early summer crops down the center, then harvest the outer rows bit by bit as the new crop needs the space or the light. This overlap allows the new crops to take over gradually.

Packing More Crops in - Keep the space filled with useful crops.

It's important to know when crops will bolt, and how to plant sensible quantities. Strategies:

- ➢ Transplant from outside in fall
- ➢ Follow-on crops
    - 11/17: We follow our 1st radishes with 3rd scallions
    - 12/23: 1st baby brassica salad mix with 5th radishes
    - 12/31: Some of our 1st spinach with our 2nd baby lettuce mix
    - 1/15: Our 1st tatsoi with our 4th spinach
    - 1/16: Our Tokyo Bekana with spinach for planting outdoors
    - 1/24: Our pak choy & Chinese cabbage with kale & collards for outdoors
    - 2/1: Our 2nd radishes with our 2nd baby brassica salad mix
    - 2/1: Our 1st Yukina Savoy with our 3rd mizuna/frilly mustards
    - 2/1: Some of our 1st turnips with our 3rd baby lettuce mix
    - 2/1: More of our 1st spinach with dwarf snap peas

- Filler crops for gaps
- Fast catch crops for big gaps
- Succession planting
    1. Gather sowing and harvest start and finish dates for each planting of your chosen crop
    2. Make a graph for that crop: sowing date along the horizontal (x) axis; harvest start date along the vertical (y) axis. Mark in all your data. Join with a line. Smooth the line.
    3. From your first possible sowing date find the first harvest start date.
    4. Decide the last *worthwhile* harvest start date, mark that.
    5. Divide the harvest period into a whole number of equal segments
    6. See the sowing dates that match your harvest start dates

Hoophouse Succession Crops Schedule

Crop	Planting Dates	Harvest Dates	Notes
Filler Greens #1	Oct 10		Replace harvested heads
Filler Greens #2	Oct 20		
"Frills" #1	transplant Oct 24	Nov 1–Jan 25	Clear 1/26, sow radishes
"Frills" #2	sown Nov 9	Jan 27–March 6	
"Frills" #3	sown Feb 1	April 10–May 10	
Tatsoi #1	sown Sept 7	Oct 30–Dec 28	Two months of harvests
Tatsoi #2	sown Nov 15	Feb 15–Feb 28	Two weeks of harvests!
Yukina Savoy #1	transplant Oct 10	Dec 30–Jan 22	Clear edge, sow lettuce mix
Yukina Savoy #2	sown Oct 24	until Jan 29	Only one week extra

- Interplanting to keep the greens later into spring

Winter Hoophouse Harvest Schedule

- ✓ October: tatsoi.
- ✓ From November onwards: As October plus brassica salad mix, mizuna, frilly mustards.
- ✓ From December: As November plus senposai and Yukina Savoy.
- ✓ From January: As December
- ✓ During December: whole plants of Tokyo Bekana, Maruba Santoh.
- ✓ During January: heads of Chinese cabbage, pak choy.
- ✓ Having the heading crops in December and January gets us through the slow-growth period.
- ✓ Most loose-leaf crops last until mid-March or later.

Harvest and After

- ❑ Don't harvest frozen crops.
- ❑ Some of these greens are harvested as whole heads; others can be harvested by the leaf and bunched or bagged.
- ❑ The open rosette types, such as tatsoi or the bigger Yukina Savoy, are usually gathered closed and banded with plant ties or rubber bands.
- ❑ Most can be grown for baby salad mix. With mizuna and Frills we do a "half buzz-cut," snipping off leaves on one half of the plant an inch (25 mm) above the ground each time we come by.
- ❑ Don't harvest too much: "8 for Later," leave at least the inner 8 leaves. (Senposai manages OK with 6 leaves)
- ❑ We switch from harvesting by the leaf to harvesting whole heads when growth speeds up, and bolting looks likely.
- ❑ After harvest, get the crops into shade and a cooler as soon as you can. Some of the heading types can be stored in a walk-in cooler for quite a while, almost as long as regular cabbage.

Minimizing Nitrate Accumulation

In winter, when light levels are low, beware of high levels of nitrates in leafy greens. They are a health hazard — nitrates can be converted in the body into nitrites, which reduce the blood's capacity to carry oxygen and may be further converted into carcinogenic nitrosamines. To keep nitrate levels as low as possible:

- Grow varieties best suited for winter;
- Avoid animal fertilizers; use organic compost.

- Ensure soil has sufficient P, K, Mg and Mo
- Water enough but not excessively;
- Provide fresh air as soon as temperatures reach 68°F (20°C), so that carbon dioxide levels are high enough;
- Harvest after at least four (preferably six) hours of bright sunlight in winter;
- Avoid harvesting on very overcast days;
- Avoid over-mature crops and discard the outer leaves. Harvest crops a little under-mature, rather than over-mature;
- Refrigerate immediately after harvest, store harvested greens at temperatures close to freezing;
- Use crops soon after harvest;
- Eat a mixed diet; don't just eat turnip greens, kale and spinach.

Pest Management

- **Harlequin bugs** are our worst brassica pests. We usually hand pick and kill them.
- If we get **flea beetles**, we use Spinosad, an enzyme produced by a soil organism. Hb nematodes will also control them, as will neem oil or the braconid wasp *Microtconus vittatoe Muesebeck*. Garlic spray, Miller's Hot Sauce, kaolin and white sticky traps have been suggested. Or catch them with a vacuum cleaner, or inside a bucket coated with Tanglefoot paste (hold the inverted bucket over the plant, shake it and catch the jumping beetles in the goo). Brassica flea beetles are a different species from eggplant ones, and they can only fly a few hundred yards/meters.
- **Aphids** are worse in cooler weather (early spring), before their predators have arrived in high enough numbers. Insecticidal soaps can be used.
- **Caterpillars** can be kept off plants with rowcover or ProtekNet. Bt (*Bacillus thuringiensis*) will kill caterpillars. Bt degrades rapidly in sunlight so is best applied early evening or early morning, whichever seems likely to catch most caterpillars. The beneficial fungus *Beauvaria bassiana* infects caterpillars, but can get costly. Caterpillars have many natural enemies. In our garden the paper wasps eat caterpillars, and we also have the parasite *Cotesia glomerata*
- **Slugs** can best be caught at night with a flashlight.
- **Grasshoppers** - Try to determine when the young hatch in July, so you know when to be most attentive to keeping them off the plants. There is a commercially available parasite.
- **Vegetable weevil larvae** have caused trouble in our hoophouse in January. They come out of the soil at night and make holes in the leaves. We have used Spinosad against them with some success.

Diseases

- Most of these greens are fast-turnaround crops, so if some get sick, pull them out and move on in life.
- If it's fall you can probably sow some spinach to provide greens without antagonizing the brassica disease gods.
- Clubroot is perhaps the longest lasting disease, requiring land to be taken out of brassica production for ten years.
- Other diseases include various molds and wilts. See ATTRA's *Cole Crops and Other Brassicas: Organic Production*

Resources

- ***Grow Your Own Chinese Vegetables,*** Geri Harrington, 1984, Garden Way Publishing. Includes the names for these crops in different cultures.
- ***Growing Unusual Vegetables,*** **Simon Hickmott, 2006, Eco-Logic books, UK.**
- ***Oriental Vegetables: The Complete Guide for the Garden and Kitchen,*** Joy Larkham, revised edition 2008, Kodansha, USA
- ***Asian Vegetables,*** Sally Cunningham, Chelsea Green
- ***The Chinese Kitchen Garden,*** Wendy Kiang-Spray, 2017, Workman Publishing
- ***Kitazawa Seeds kitazawaseed.com/*** Many choices.
- ***Evergreen Seeds*** Many choices . Helpful clickable list***. evergreenseeds.com/asveglis.html***
- ***Fedco Seeds fedcoseeds.com/ , Johnny's johnnyseeds.com/*** - good ranges**.**
- ***Wild Garden Seed.*** Search under Mustard**.** ***wildgardenseed.com***
- ***Even' Star Farm Ice-bred Seeds localharvest.org/even-star-organic-farm-M9994***
- ***Good Earth Seed Company (Tsang and Ma International)*** P.O. Box 5644, Redwood City, California 94063. No English website.

Resources - Season Extension

- ***Extending the Season: Six Strategies for Improving Cash Flow Year-Round on the Market Farm*** Lynn Byczynski
- Janet Bachmann, ***Season Extension Techniques for Market Gardeners,*** ATTRA, 2005. ***attra.ncat.org/attra-pub/summaries/summary.php?pub=366***
- ***Fall and Winter Gardening Quick Reference,*** Southern Exposure Seed Exchange, ***www.southernexposure.com/growing-guides/fall-winter-quick-guide.pdf***
- ***www.johnnyseeds.com.*** Growers' Library, Winter growing guide
- ***Solar Gardening: Growing Vegetables Year-Round the American Intensive Way,*** Leandre Poisson, Gretchen Poisson and Robin Wimbiscus, 1994, Chelsea Green
- *Greenhouse and Hoophouse Grower's Handbook – Organic Vegetable Production Using Protected Culture,* Andrew Mefferd, New Society

Resources – More Detail

- **ATTRA *Cole Crops and Other Brassicas: Organic Production* https://attra.ncat.org/product/cole-crops-and-other-brassicas-organic-production**
- **Saving Our Seed Project https://projects.sare.org/sare_project/ls03-156 An excellent 24-page guide on organic brassica seed production**
- ***The Organic Seed Grower,* John Navazio, 2014, Chelsea Green**
- **USDA plant database https://plants.sc.egov.usda.gov/home**
- **International Code of Nomenclature for algae, fungi, and plants 2018 iapt-taxon.org/nomen/main.php**
- **Missouri Botanical Garden Plant FInder: https://www.missouribotanicalgarden.org/plantfinder/plantfindersearch.aspx Search *Brassica rapa*, for example**
- **Vegetable Varieties for Gardeners. Search for "Mustard" vegvariety.cce.cornell.edu/main/showVarieties.php**