

Characteristics of cucurbits and their field cultivation

Watermelon (W), Melon (M),
Cucumber (C), Squashes (S)

Taxonomy and origin II

- **Cucumis genus** (32 species)
- **cucumber** (*Cucumis sativus*) – originated from Himalayan foothills (India)
- **melon** (*Cucumis melo*) – originated from Africa (?), domesticated in India or Iran;
- **Cucurbita genus** (5 domesticated and 10 wild species) – squash, marrow, pumpkin, gourd
- originated from Mexico (*C. pepo*, *C. moschata*) or from South-America (*C. maxima*), domesticated in Mexico (*C. maxima*, *C. moschata*, *C. pepo*), in USA (*C. pepo*) and in South-America (*C. maxima*)

Uses

- Grown mainly for their fruits
- Sometimes shoots (C) and flowers (S) are also eaten
- Consumed fresh as vegetable (C) or fruit (W, M)
- Cooked (summer S)
- Pickled (C)
- Baked, canned, frozen (pumpkin)
- Snack – seeds (40-60% fat and oil, 30-40% protein)
- Medicinal applications
- Cosmetic products (C)
- Decoration (S)

Taxonomy and origin I

- **Cucurbitaceae family** (118 genera, 825 species) – frost sensitive, mainly annual, tendril bearing vines, found in subtropical and tropical regions around the globe.
- **Cucurbits** = cultivated species of the Cucurbitaceae
- **Cucurbitoideae subfamily** – the major (watermelon, melon, cucumber, squash) and the important (loofah, bottle gourd, chayote, wax gourd, bitter melon) crops belong here
- **Citrullus genus** (3-4 species)
- **watermelon** (*Citrullus lanatus*) – originated from Africa (Ethiopia)

Nutritional value

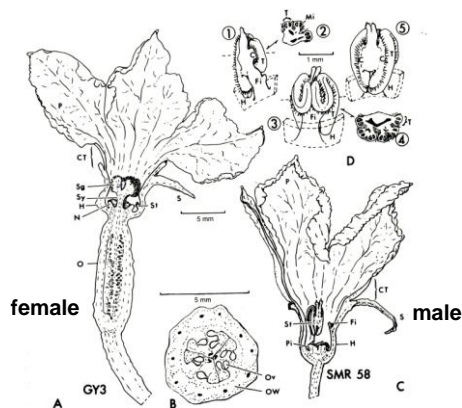
- High water content, up to 95% (C), → little nutritional value
- Biologically pure water
- Sugar content can reach 8-16% (M, W)
- Carotenes (orange fleshed M, S) – precursors of vitamin A
- Lycopene (W)
- Other bioactive compounds: cucurbitacins (cause bitterness), saponins, glycosides, alkaloids

Importance I

- **Watermelon** – the most consumed cucurbit, almost exclusively grown on the field
- **World:** 3,5 M ha; 117 M t; 33 t/ha
- China 68%, Turkey 3,4%, Iran 3,3%
- **EU:** 78 th. ha; 2,9 M t; 37 t/ha
- Spain 34%, Greece 19.4%, Italy 18.7%, Romania 14.7%, Hungary 6.9%
- **Melon** – important field and greenhouse crop
- **World:** 1,2 M ha; 31 M t; 25 t/ha
- China 52%, Turkey 6%, Iran 5.2
- **EU:** 70 th. ha; 1,7 M t; 25 t/ha
- Spain 38%, Italy 36%, France 14%

Importance II

- **Cucumber, gherkin** – important field and greenhouse crop almost everywhere in the world
- **World:** 2,1 M ha; 81 M t; 38 t/ha
- China 77%, Russia 2.5%, Turkey 2.3%, Iran 2.1%,
- **EU:** 51 th. ha; 2,9 M t; 57 t/ha
- Spain 26%, Poland 18%, Netherlands 13%, Germany 9%
- **Pumpkin, squash, gourd**
- **World:** 2,0 M ha; 26 M t; 13 t/ha
- China 29%, India 19%, Russia 4.6%, Ukraine 4.6%
- **EU:** 66 th. ha; 1,6 M t; 25 t/ha
- Italy 36%, Spain 29%, Bulgaria 8%, Germany 8%



Morphology I

- **Root system:** strong taproot, which is not so pronounced in case of transplanting; secondary roots situate in the upper soil layer; adventitious root formation from the stem nodes
- **Stem:** herbaceous; usually indeterminate (bush forms are also existing), trailing or climbing (C) vines; angled; usually hairy; unbranched solitary tendrils; angular (W, C) or round (M)
- **Leaf:** large and thin; simple or lobed (M, C, S), pinnatifid (W)
- **Flower:** unisexual pentamerous flowers; male and female flowers are borne at different nodes; yellow petals; inferior ovary; insect pollinated; self-compatible

Morphology II

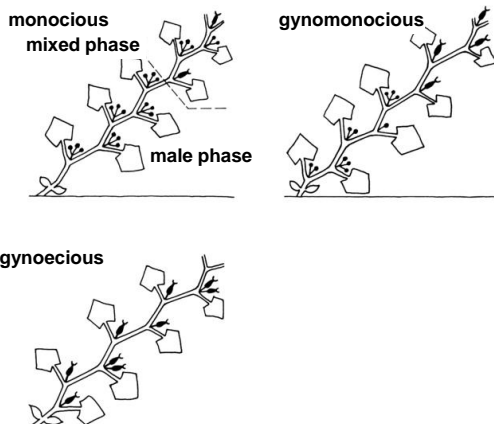
- **Sex expression:** usually monoecious, sometimes andromonoecious (M); female flowers on lateral branches (M)
- **Fruit:** fleshy, indehiscent 'pepos'; 1-3 locules;
 - **watermelon:** large; round, oblong or cylindrical; glabrous; flesh is usually red
 - **melon:** glabrous, variable in shape and colour; flesh can be orange, green or white
 - **cucumber:** oblong, narrowly cylindrical; warts and small spines on the rind
 - **squashes:** very diverse
- **Seed:** flat; big compared to other vegetable crops

Types of cultivars

- **Watermelon**
- 'Sugar Baby', 'Charleston Grey', 'Crimson Sweet' types
- Diploid (seeded) and triploid (seedless) types
- Size – ice box type
- **Melon** - 6 cultivar groups based on fruit characteristics and uses
- **Cantalupensis** (cantaloupe, muskmelon) – Gallia, Cantaloupe, Italo-American supermarket type, Ogen, Charantais
- **Inodorosus** (winter melon) – Honey Dew, Juan Canary (Amarillo), Piel de Sapo
- **Flexuosus** (snake melon); **Conomon** (pickling melon); **Dudaim** (pomegranate melon); **Momordica** (phoot, snap melon)

Types of cultivars

- **Cucumber**
- **Based on sex expression:** monocious, gynomonocious, gynoeciuous
- **Based on use:** slicers – more smooth rind; picklers (gherkins) 3:1 length to width ratio; white spined, black spined
- **Squash**
- 8 different types are distinguished: pumpkin, scallop, acorn, crookneck, straightneck, vegetable marrow, cocozelle, zucchini



Ecological needs

- **Light:** usually day-neutrals, high intensity is needed for optimum yield; sunburn injury of immature fruits can occur
- **Temperature:** (18)-20-30°C for best growth; 25-35°C is optimal for germination, inhibited below 15°C; very sensitive to low root-zone temperature, below 20°C water uptake is restricted; chilling injury under 10°C; killed by the frost
- **Water:** most cucurbits have high water need; watermelon is fairly drought resistant
- **Soil:** well-drained soils with a relatively high organic content and adequate aeration is needed; don't tolerate 'wet feet'; pH 5,6-6,8
- **Nutrients:** likes manuring; cucumber is relatively salt sensitive; moderate NPK request, high Mg and Ca need; K for pigment formation and sugar content

Cultivation I

- **Crop rotation:** solanaceous crops should be avoided; monoculture is possible (grafting)
- **Land preparation:** deep ploughing, disking, harrowing; broadcasting or banding manure and fertilizers; raised bed formation, plastic mulching
- **Row covers:** low tunnels are used for enhancing earliness (floating rowcovers)
- **Propagation:** direct seeding when soil temperature reaches (12)-15°C
- planting after late frost have passed; 3-4 week-old seedlings; bare-rooted seedlings and pricking off should be avoided
- row distance 0,9 - 3 m; between plants 0,3 – 1,3 m → 2.500 – 40.000 plants/ha
- grafting

Cultivation II

- **Irrigation:** supplementary water is usually supplied; blossom-end-rot during moisture stress
- **Support, training, pruning:** pickling cucumber sometimes grown on vertical trellises; pruning affects female flower earliness
- **Weeding:** shallow cultivation and hoeing during the early growth phase
- **Pollination:** use of growth regulators to modify sex expression; pollinating diploid variety for triploid watermelons; sometimes hives of bees are placed to enhance pollination

Cultivation III

- **Harvest:** usually multiple harvests by hand, sometimes difficult to judge maturity (W); in biologically matured stage (W, M, pumpkin) or small immature fruits are picked (C, summer squash), frequency of harvest ↔ fruit size
- (once-over mechanical harvest for pickling cucumber)
- from anthesis until picking needs 3-7 days (C, cucchini) to 3-4 months (pumpkin)
- **Post harvest** – fruits harvested immature needs careful handling; storage at 7-13°C, 85-95% rh; mature squashes can be stored up to 6 months; melon needs cooling, padded shipping boxes; pickling cucumbers are sorted before processing