

Propagation of vegetables

Classification of vegetables based on their usual method of sexual propagation

- **exclusively by direct seeding** – green pea, snap bean, spinach, carrot, parsley, parsnip, table beet, radish
- **mainly by direct seeding** – onion, sweet corn
- **both direct seeding and transplanting are usual** – industrial tomato, spice pepper, gherkin, squash, pumpkin, broccoli, Brussels sprouts
- **mainly by transplanting** – pepper, table tomato, eggplant, melon, watermelon, salad crops, most cole crops, celeriac, asparagus

Main parameters of direct seeding

- **time**
 - springtime, when soil temperature exceeds 4-6°C – parsley, carrot, onion, leek, green pea, cole crops, leafy vegetables
 - springtime, when soil temperature exceeds 10(-12)°C – solanaceous crops, cucurbits, snap bean, sweet corn
 - summertime – secondary crops, overwintering crops
- **depth** ↔ size of the seed, length of germination, soil structure
- **method** – hand or machine; arrangement of rows;
- **amount of the seeds** – given in weight for open pollinated cultivars, and in number for hybrids

Classification of propagation methods

Propagation is the process of creating new plants from different plant parts.

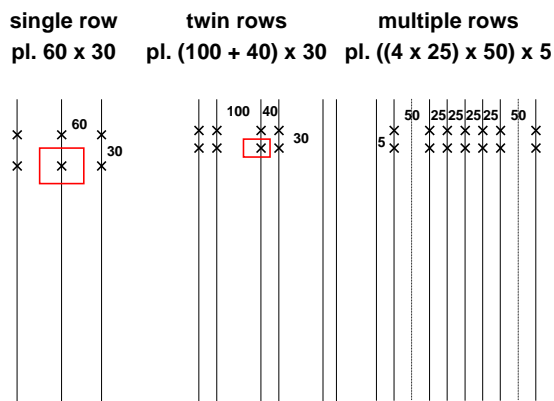
- **Tissue culture**
 - (micropropagation - tissues are used)
 - eg. asparagus
- **Asexual (vegetative)**
 - tuber crops – tubers, cuttings
 - garlic – clove
 - horse radish – root
 - rhubarb – division
 - mushrooms – mycelium (grafting?)
- **Traditional methods**
 - (macropropagation – organs are used)
 - most of the vegetables
- **Sexual (generative)**
 - most of the vegetables
 - direct seeding** – seeds are sown to a permanent place
 - transplanting** – seeds are sown to a transitional place

Direct seeding

- + cheap (?), simple, easy to mechanise, better drought tolerance
- less reliable, more seeds are needed, less uniform plant growth, longer growing period on the field

□ Main parameters of direct seeding:

- Time of sowing
- Depth of sowing
- Method of sowing
- Amount of the seeds needed



Transplant production

- Seeds of herbaceous plants are sown into a transitional place, before transplanting into the permanent location.
- + More reliable, better plant stand, more uniform plant growth, earliness, longer growing season, more possibility for double cropping
- More expensive, less easy to mechanise, more plant protection issues
- Main elements of transplanting technology
 - Time, method, place and density of sowing
 - Method of transplant raising/ type of the transplant – bare-rooted~, plug~, sod block~, soil block~, box~, pot/container transplant
 - Conditioning
 - Transplanting – method, time, spacing,

- **Place** – soil of the greenhouse/tunnel, seed flat, seedling tray, soil block, pot/container
- **Density** – thin (100-700 piece/m²)
 - medium (700-1500 piece/m²)
 - dense (1500 – 5000 piece/m²)

Seedling tray method

- 50-60 (L) x 27-40 (W) x 5-8 cm (H) plastic (polystyrene, polypropylene) trays (40-336 holes / tray, Ø = 2-6 cm) are sown or pricked out
- can be mechanized and automated
- currently the most common method in Europe
- versatile, suitable for many purposes
- requires precise technology - timing, avoiding elongation, even watering, nutrient solution application
- issue of reusing trays

Sowing for transplant production

- **Time** ⇔ date of transplanting, desired transplant size (length of transplant raising)
- **length of transplant raising** ⇔ species, environmental factors (season), method of transplant raising, needed developmental stage for transplanting
- salad crops, cole crops, cucurbits: (3)-4-5 weeks; solanaceous crops: 5-6 weeks; celeriac: 8-10 weeks; asparagus
- **Method:** (by hand), by machine

Bare-rooted seedlings

- the seeds are sown in the soil of the seedling bed at a density of 800-1,500 pieces/m²
- the cheapest, easiest method; you do not need any assets
- cannot be mechanized
- its establishment is the most uncertain; less reliable, less predictable method

Sod block method

- less widely used method today; was common in the cultivation of cucurbit seedlings
- dense lawn was cut into 8-10 cm cubes, turned down and the seed was sown
- quite labor-intensive, difficult-to-mechanize method, the structure of the block is not very controllable

Soil block method

- sown or pricked out in (3)-4-7-(10) cm edge length cubes made of pot mixture
- suitable for growing large, well developed transplants
- they can be spread out if necessary
- assets are not needed
- relatively easy to mechanize
- care must be taken to ensure that the roots do not grow into the soil or into the neighbour cube
- the physical structure of the cube is less favorable than that of the tray and pot methods, because of the pressing process

Potted/containerised method

- plastic "pots" with a diameter of 7-10- (12) cm are pricked out or sown into
- the most developed transplants can be produced by this method
- the transplants can be spread out if necessary
- can be mechanised relatively well
- the most expensive method
- not widely used for outdoor and unheated tunnel/greenhouse cultivation
- The pots represent additional resource requirements and they must be collected and disinfected before reuse

Conditioning

- (Temperature and light control)
- Irrigation
- Supplemental feeding - topdressing, fertigation
- Spreading out → better light supply
- Hardening → for withstanding field conditions
- Plant protection

Soil blocks placed in box

- an improved version of the original soil block method
- Soil blocks with 4-5 cm edge length are located in crates, 2 mm apart from each other
- root outgrowth is less of a problem
- it can be mechanized and automated better
- the crates are an additional asset requirement; their return and disinfection must be taken care of

Methods of transplant raising/Types of transplants

- Bare-rooted
- Methods employing „root ball”
 - seedling tray → plug transplant
 - sod block transplant
 - soil block transplant (without or with pricking out)
 - box transplant
 - pot/container transplant (without or with pricking out)
- Pricking out – when the first true leaves are forming
 - + Spare of place and heating cost, more dense root system, selection of seedlings
 - Higher labour need, longer raising period (Cucurbits can't be pricked out!)

Transplanting

- Time:
 - after soil and air temperature exceeds 6-8°C: cole crops, salad crops
 - (springtime) after the last frost; when soil and air temperature exceeds 10-12°C: solanaceous crops, cucurbits
 - summertime: aftercrops, overwintering crops
- Method – (by hand), by machine
- Depth – tomato → ← lettuce
- Washing the soil to the roots