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# Pollination for Berry Production

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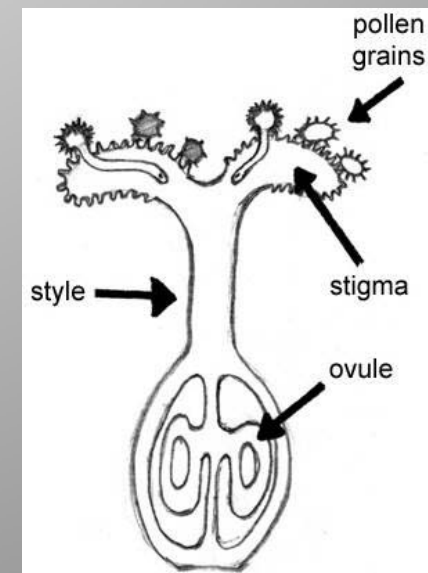
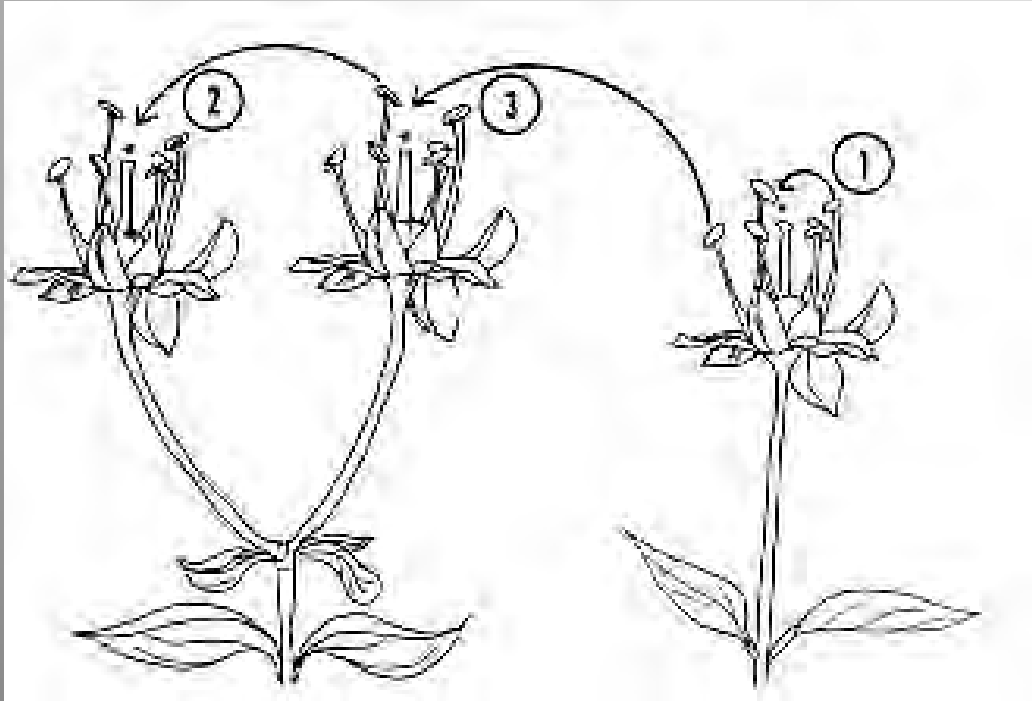


# What is Pollination?

- Transfer of pollen

1. Self-pollination (autogamy)
2. Self-pollination (geitonogamy)
3. Cross-pollination (xenogamy)

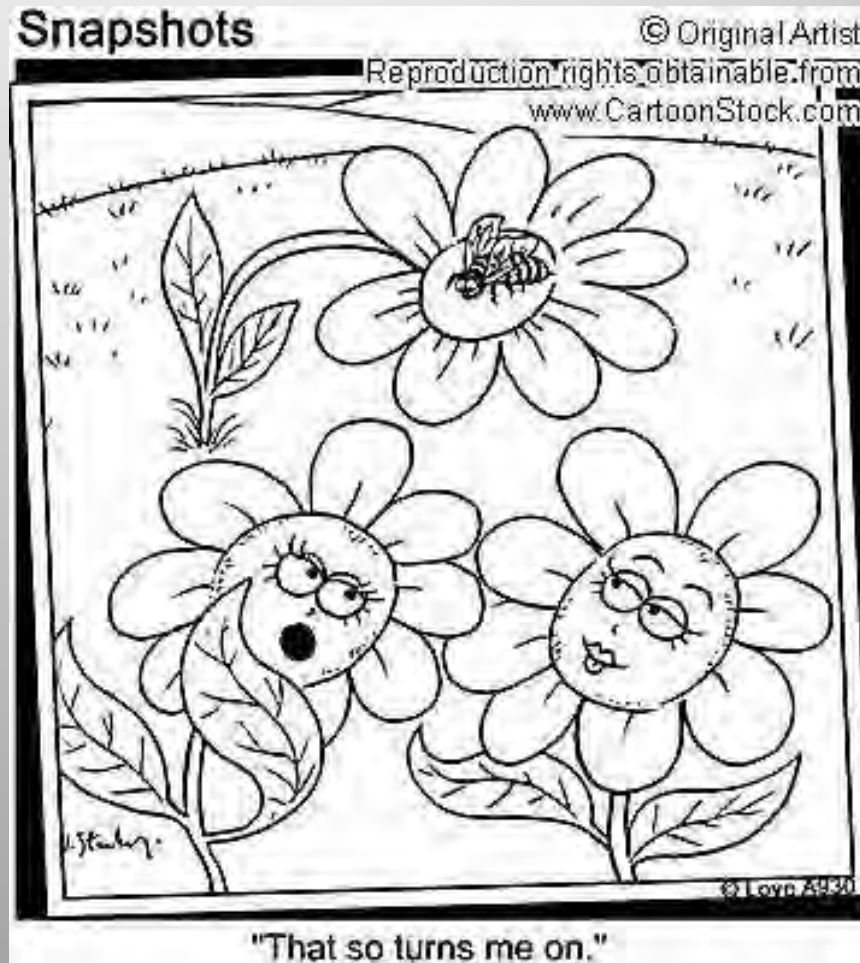
Prelude to fertilization ... seeds & fruits



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# What is Pollination?

- Plant Sex!



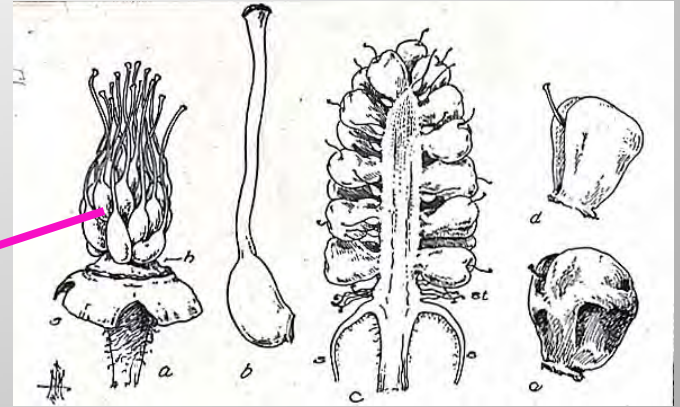
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# Blackberry

*Rubus fruticosus*



Stigma



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# Blackberry

*Rubus fruticosus*

- **Breeding System:** self-sterile to partially self-fertile
- **Pollination System:** wide open flower accessible to many insects; cross-pollination by insects needed
- **Pollinators:** many kinds of insects, honeybees
- **Notes:** loganberries, youngberries, boysenberries and dewberries are various *Rubus* spp. and hybrids with raspberries (*Rubus idaeus*)



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# Black Currant

*Ribes nigrum*



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# Black Currant

*Ribes nigrum*

- **Breeding System:** self-fertile
- **Pollination System:** insects needed to move pollinate even on the same flowers
- **Pollinators:** some native insects e.g. Small bees, honeybees
- **Notes:** wind may shake flowers to allow some pollination



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# Blueberries

*Vaccinium angustifolium & corymbosum*



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# Lowbush Blueberry

*Vaccinium angustifolium*

- **Breeding System:** mostly self-sterile
- **Pollination System:** buzz pollination by many kinds of wild bees
- **Pollinators:** wild bees, bumblebees, honeybees, leaf cutting bees
- **Notes:** self-fertility seems more common in isolated small populations; hugely important wildlife food (black bears, migratory birds)



Leaf cutting bee  
domicile shelter

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# Highbush Blueberry

*Vaccinium corymbosum*

- **Breeding System:** mostly self-sterile; questions of varietal self-sterility vs. within plant self-sterility
- **Pollination System:** buzz pollination by many wild bees; flowers differ in size, depth and opening by variety so restrict access to some pollinators
- **Pollinators:** many wild bees, bumblebees, honeybees, leaf cutting bees
- **Notes:** Some varieties require other pollinizer nearby, others need cross-pollination between plants of the same variety

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# Cloudberry or Bake-apple

*Rubus chamaemorus*



Female flower



Male flower

Plants of two separate sexes: dioecy

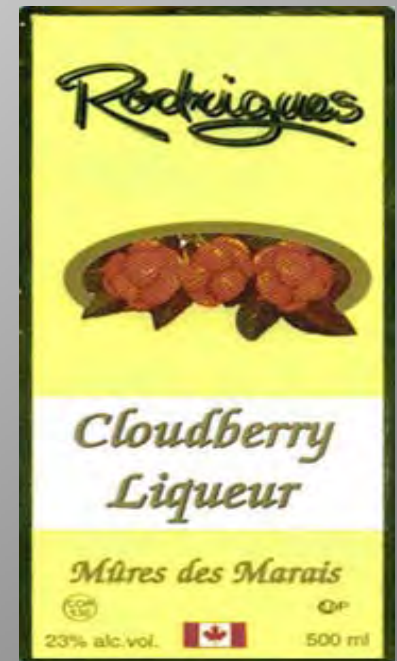


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# Cloudberry or Bake-apple

*Rubus chamaemorus*

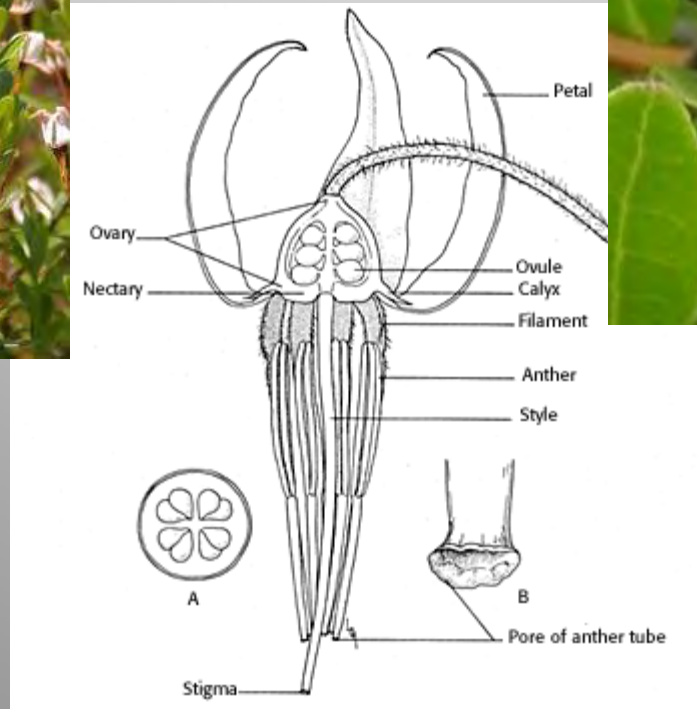
- **Breeding System:** obligate outcrosser, plants have two separate sexes (species is dioecious)
- **Pollination System:** male plants offer pollen as the reward to pollinators; female plants may offer minute amounts of nectar
- **Pollinators:** mostly small to medium sized pollen eating flower flies (Syrphidae)
- **Notes:** harvested commercially in N Europe, NFLD and interest now in Quebec



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# Cranberry

*Vaccinium macrocarpon*



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# Cranberry

*Vaccinium macrocarpon*

- **Breeding System:** probably mostly self-sterile
- **Pollination System:** day 1 flowers shed pollen, stigma non receptive till day 2; buzz pollination by pollen foraging bees
- **Pollinators:** bumblebees especially good, honeybees used for commercial production
- **Notes:** better pollination =  
more seeds =  
bigger berries



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# Elderberry

*Sambucus canadensis*



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# Elderberry

*Sambucus canadensis*

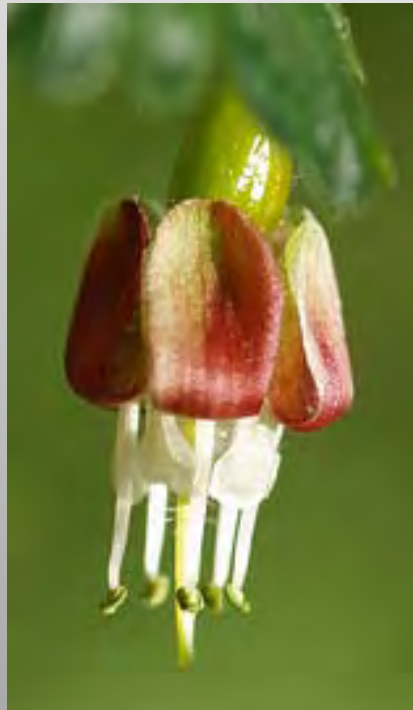
- **Breeding System:** unknown, self-pollination easily done but self-fertility not proven
- **Pollination System:** unknown, flowers have characteristic 'muscatel' scent and no nectar: heavier bearing with cross-pollination
- **Pollinators:** various flies and beetles
- **Notes:** Closely related to European *S. nigra*; more research needed



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# Gooseberry

*Ribes uva-crispa*



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# Gooseberry

*Ribes uva-crispa*

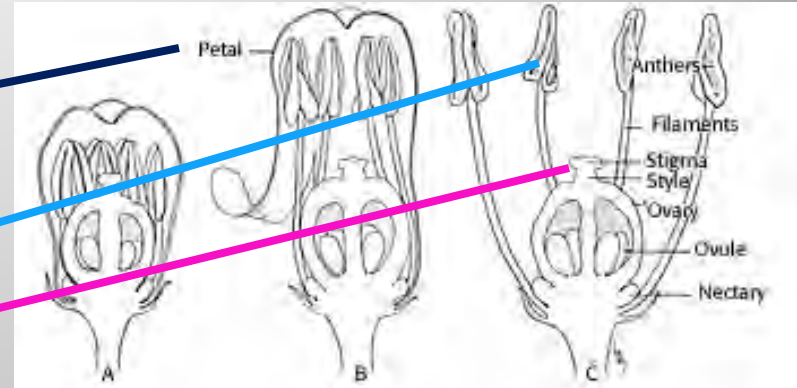
- **Breeding System:** self-fertile
- **Pollination System:** mostly self-pollinating but insect pollination increases yield
- **Pollinators:** small bees and honeybees



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# Grape

*Vitis vinifera*



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# Grape

*Vitis vinifera*

- **Breeding System:** self-fertile
- **Pollination System:** mostly by wind
- **Pollinators:** mostly wind
- **Notes:** wild grapes have vines of two separate sexes and require cross-pollination which occurs by wind and insects



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# Haskap = Blue Honey Suckle

*Lonicera caerulea*



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# Haskap = Blue Honey Suckle

*Lonicera caerulea*

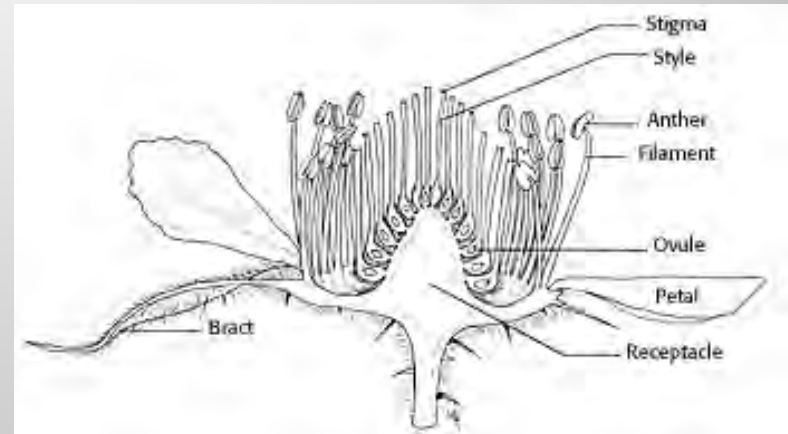
- **Breeding System:** cross-pollination between varieties is required (self-sterile)
- **Pollination System:** tubular flowers offer nectar to bees with longish tongues
- **Pollinators:** understudied; probably well served by bumblebees; honeybees can be used
- **Notes:** blooms very early when honeybees not very active; nectar robbing could be a problem



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# Raspberry

*Rubus idaeus*



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# Raspberry

*Rubus idaeus*

- **Breeding System:** self-fertile to self-infertile (seem to be differences between varieties, hybrids and species)
- **Pollination System:** well served by honeybees for both cross- and self-pollination; produce plentiful nectar
- **Pollinators:** many insects, especially bees collecting nectar and pollen



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# Red Currant

*Ribes rubrum*



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# Red Currant

*Ribes rubrum*

- **Breeding System:** unknown, probably self-fertile
- **Pollination System:** unknown, higher yields with honeybees
- **Pollinators:** little is known



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# Rose Hips

*Rosa* spp.



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# Rose Hips

*Rosa* spp.

- **Breeding System:** ranges from self-fertile to self-sterile depending on species
- **Pollination System:** insect pollination is important, rose flowers produce only pollen as pollinator reward
- **Pollinators:** mostly bees, some flies and beetles; honeybees useful
- **Notes:** more research on pollination for commercial production is needed



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# Saskatoon Berry = Service Berry

*Amelanchier alnifolia*

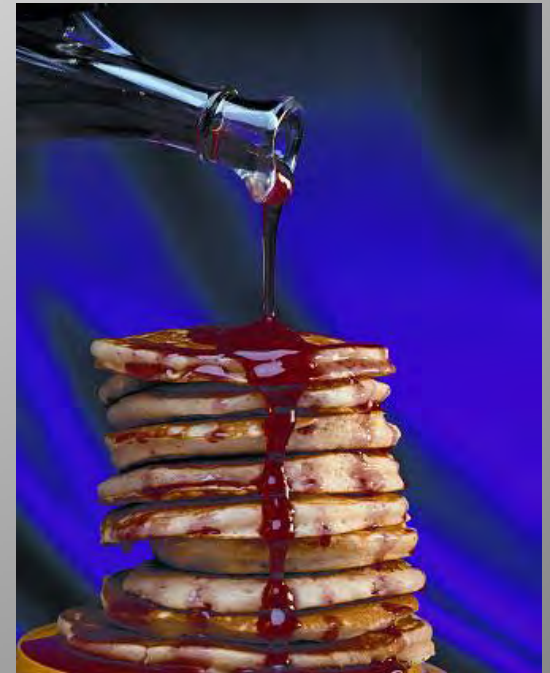


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# Saskatoon Berry = Service Berry

*Amelanchier alnifolia*

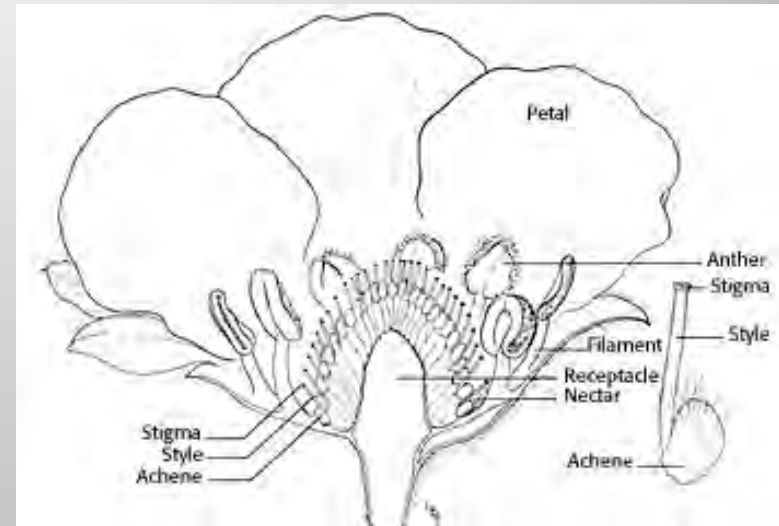
- **Breeding System:** Self-fertile
- **Pollination System:** Open to many kinds of insects, flowers sweetly scented.
- **Pollinators:** Wild bees, flies
- **Notes:** Higher yield with open (cross) pollination. Blooms early in late spring to early summer



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# Strawberry

*Fragaria x ananassa*



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# Strawberry

*Fragaria x ananassa*

- **Breeding System:** from self-sterile to self-fertile depending on cultivar
- **Pollination System:** wide open flower served by many kinds of insects collecting nectar and/or pollen
- **Pollinators:** many wild bees, flies, honeybees for production fields
- **Notes:** pollination requirements need study, systems are complex and dependent on cultivar



# Conclusions

- General pollination requirements for berry crops are well to poorly understood
- Most indications are that having adequate pollination by insects is important to maximize yields (grapes excepted)
- Breeding systems need to be elucidated by species and cultivar in almost all berries
- NSERC-CANPOLIN's first target will be blueberries

# News

- Blueberry “hit-team” assembling (Guelph, UPEI, NSCAC, York, McGill, UNB, Laval, Western, ACORN, AAFC, and others)
  - Genomics
  - Breeding System
  - Pollinators
  - Pollination
  - Pollinators & Biocontrol of fungal pests
  - Production/agronomy
  - Economics



# Acknowledgements

- I thank the Atlantic Canadian Organic Regional Network for inviting me to make this presentation
- Special thanks go to Dr. Jim Kemp, Alan Hicken and friends from PEI for encouraging this synthesis