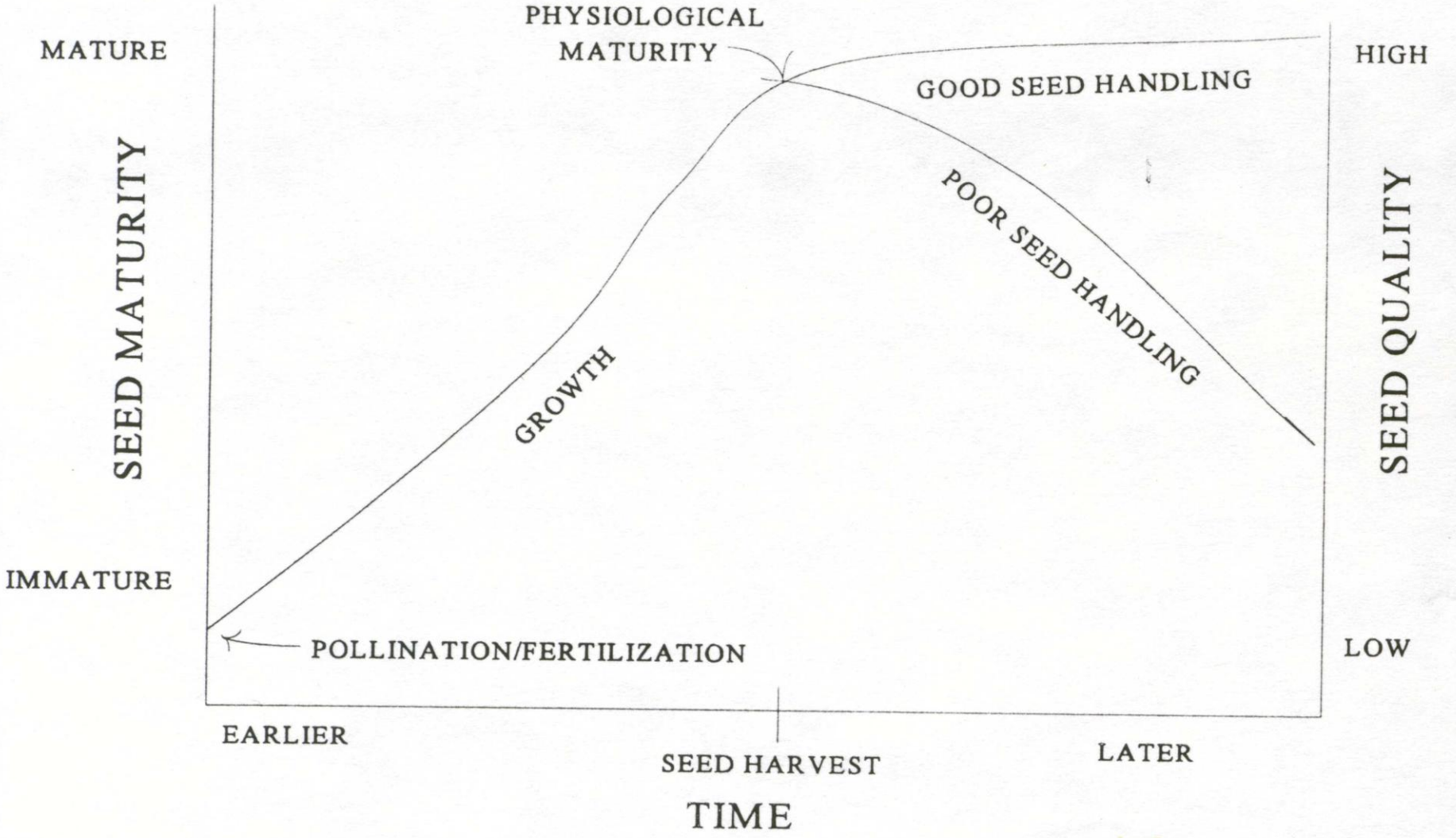
Improving Germination of Hardwood Seed

Victor Vankus
USDA Forest Service
National Seed Laboratory
www.nsl.fs.fed.us

Challenges Working with Hardwood Seed

- low quality seed
- dormancy
- handling and cultural practices

What can we do to overcome these challenges?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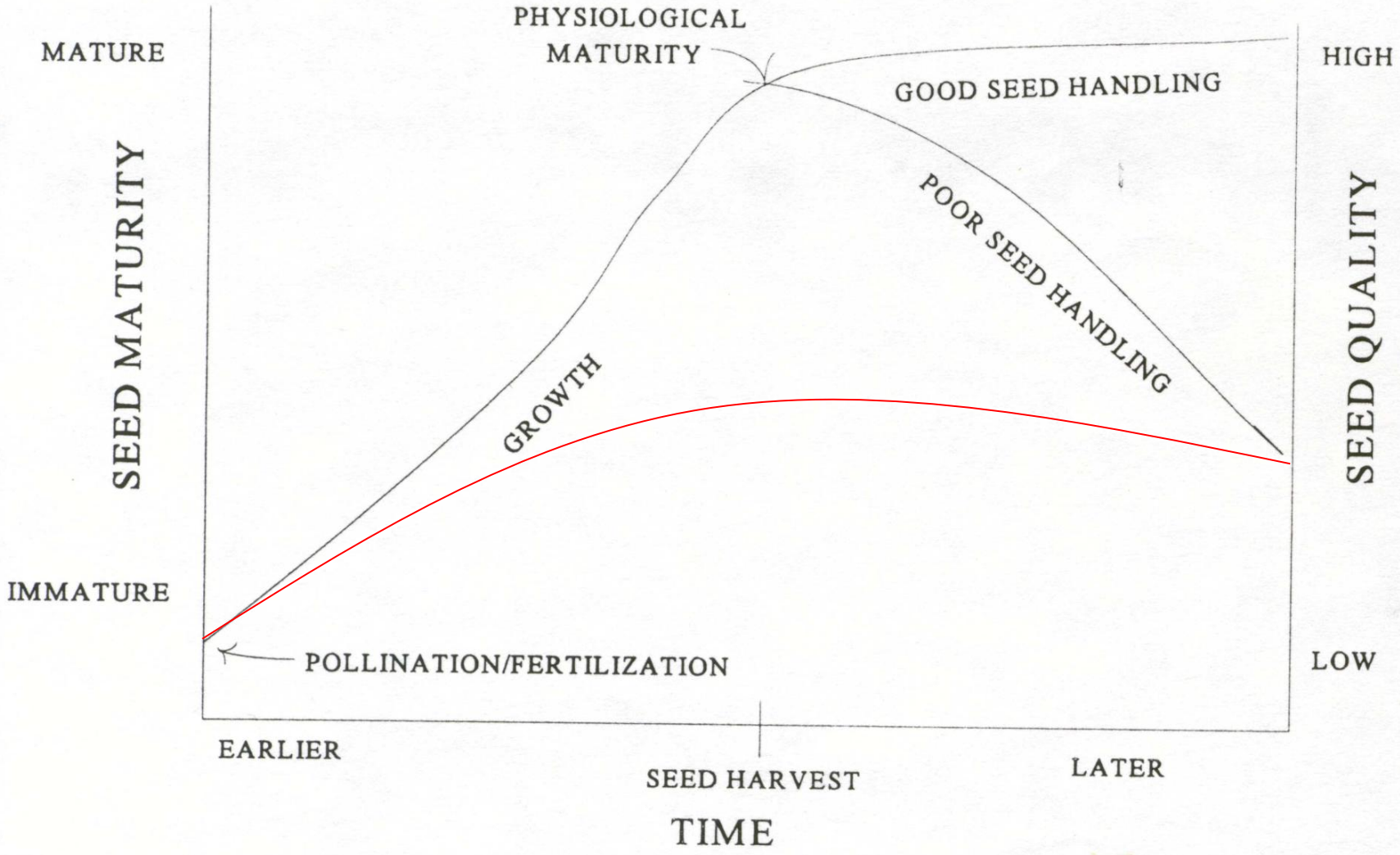
HIGH
GOOD SEED HANDLING
POOR SEED HANDLING
SEED MATURITY
SEED QUALITY
GROWTH
IMMATURE
POLLINATION/FERTILIZATION
LOW
EARLIER
SEED HARVEST
LATER
TIME

Factors Influencing Seed Quality

- Genetics
- Environmental Conditions prior to Harvest
- Insects and other Pests
- Post Harvest Conditions
  - Seed Collection, processing, storage
  - Cultural Practices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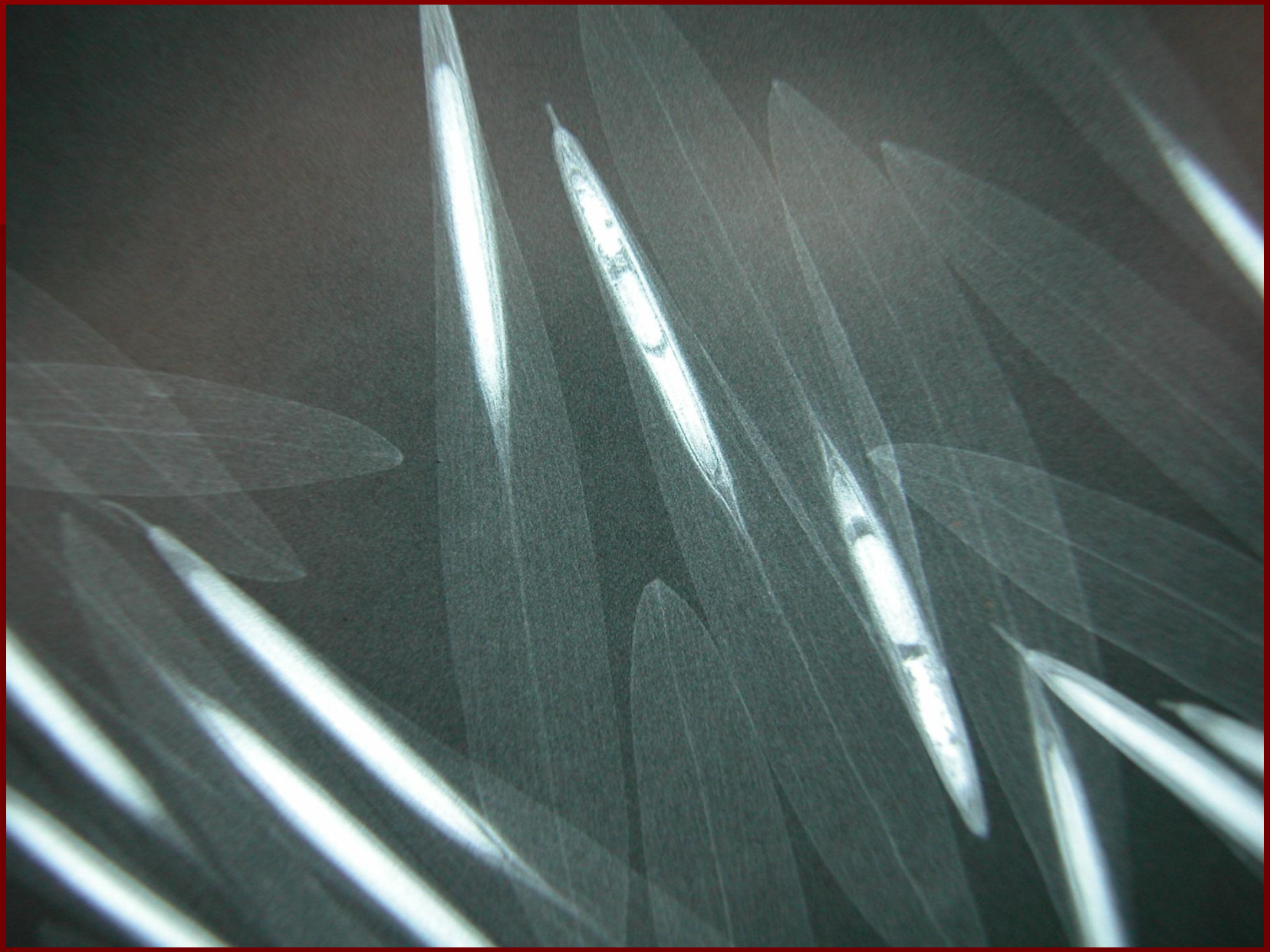

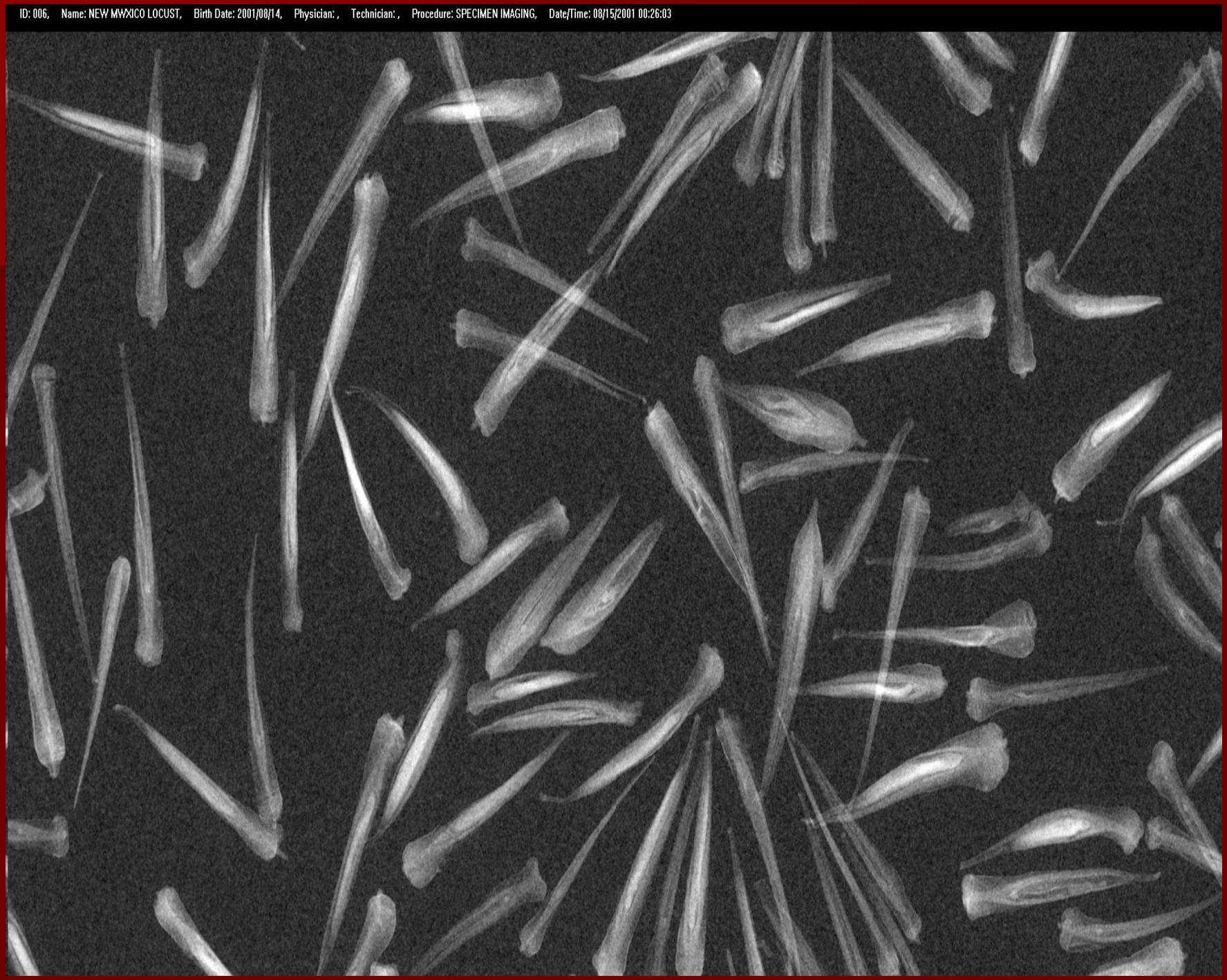
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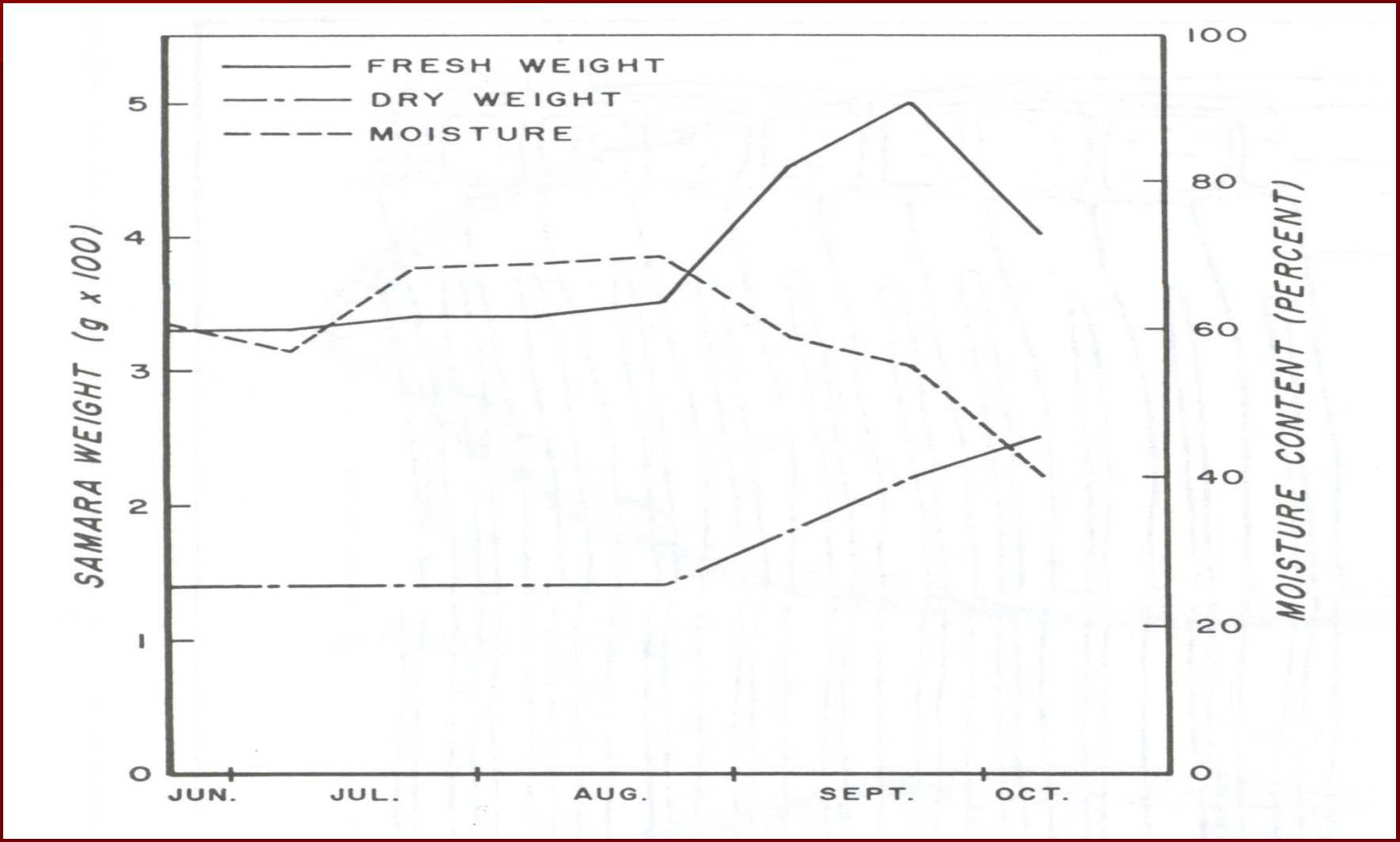
What Factors can we Control or Influence?

- Pest Control
- Knowledge of Plant and Seed Biology
- Collection
- Processing
- Storage
- Germination Pretreatments
- Nursery Operations

Plant and Seed Biology

- Flowering Characteristics
  - monoecious, dioecious, perfect, polygamous
- Reproductive Cycles
  - pollination and fertilization
- Seed and Fruit Development
  - embryo and endosperm formation
  - cell division
  - metabolic changes
  - most hardwoods produce seed in one season

Physiological Changes to Maturity moisture in ash



Seed Collection

- Species Identification and location
- Needed to collect the seed at its best – at physiological maturity and before dispersal
- Field observations and tests
  - Fruit color changes
  - Embryo and endosperm development
  - Moisture content changes

Post Harvest Handling

- How will the seed be shipped and stored before cleaning and use?
  - Moist fruit: keep moist but not anaerobic
  - Dry fruit: keep dry, allow to dry
  - Avoid heating, generally low ambient temps
- Drying, Afterripening, etc. –
  - hold seed for the right length of time and process at the right time

Seed Processing

- Ensure processing is not damaging the seed
- Process to the point that it is cost-effective for both processing and nursery operations
- Understand species biology


DANGER
DISCONNECT BEFORE SERVICING
Weed's
ULTRACON II

Seed Storage

- Temperature, air flow, containers, moisture content
- Orthodox seed can be dried to below 10% moisture content
- Recalcitrant Seed must be kept at high moisture
  - Oaks > 25% m.c. , Chestnuts, Some maples

Moisture content thresholds and potential effects on stored seeds of most species

Percent	Effects
>30	Germination begins
18 to 20	Overheating from respiration in storage
10 to 18	Seed fungi become active
>9	Insect activity
5 to 8	Best range for sealed storage
<5	Desiccation damage possible in some species


CENTER WEST
DOGWOOD OZ-3

INTERNATIONAL FOREST SEED
P.O. BOX 290
ODENVILLE, ALABAMA
TELEX 5-9842 IFSCO

Dormancy

- Prevents seed from germinating under favorable conditions
- Can vary by seed source, year, age
- Types of Dormancy
  - seed coat or external - legumes
  - embryo or internal
  - morphological
  - secondary or induced
  - combined and double

Seed Coat or External Dormancy

- Cercis, Robinia, some Quercus

- Pretreatment - Scarification
  - acid
  - hot water
  - physical

Embryo or Internal Dormancy

- Fraxinus, Prunus, Magnolia – chemical inhibitors in tissues around the embryo
- Physiological immaturity – most common
  - don't yet have chemical pathways in place to begin germination
- Pretreatments
  - water soak
  - prechill
  - alternating afterripening or pretreatment temps.

Afterripening and germination of seeds of American highbush cranberry (*Viburnum trilobum*)

PAUL FEDEC[1] AND R. H. KNOWLES

Department of Plant Science, University of Alberta, Edmonton, Alberta

Received January 29, 1973

FEDEC, P., and R. H. KNOWLES. 1973. Afterripening and germination of seeds of American highbush cranberry (*Viburnum trilobum*). Can. J. Bot. **51**: 1761–1764.

Seed of the American highbush cranberry, *Viburnum trilobum* Marsh., kept at germinative conditions of 20°C, required 328 days to reach 92% germination. Initially, about one-half the seed germinated within 120 days. After a 120-day lag, the balance germinated. Afterripening, with as little as one cycle of alternating temperature (1 week at 20°C and 1 week at 2°C) shortened the time to total germination by 4½ months. The inductive effect of afterripening was studied in relation to utilization of the high lipid reserve present in the endosperm. No appreciable changes in polar and non-polar lipids occurred during prolonged exposure to either afterripening or germinative conditions, indicating that afterripening is not associated with lipid degradation. Gibberellic acid (GA_3) had little effect on seed germination but successfully overcame epicotyl dormancy of the seedling.

FEDEC, P., et R. H. KNOWLES. 1973. Afterripening and germination of seeds of American highbush cranberry (*Viburnum trilobum*). Can. J Bot. **51**: 1761–1764.

Des graines de *Viburnum trilobum* Marsh., maintenues dans des conditions de germination, soit 20°C, n'ont atteint 92% de germination qu'après 328 jours. Initialement, environ la moitié des graines ont germé en 120 jours. Après un délai de 120 jours, le reste des graines germèrent. Une post-maturation, avec aussi peu qu'un cycle d'alternance de température (1 semaine à 20°C et 1 semaine à 2°C), a raccourci de 4½ mois le temps nécessaire pour obtenir une germination complète. L'effet inducteur de la post-maturation a été étudié en rapport avec les réserves riches en lipides de l'endosperme. Aucun changement appréciable dans les lipides polaires et non polaires ne s'est produit au cours des conditions de post-maturation et de germination, ce qui indique que la post-maturation n'est pas associée à la dégradation des lipides. Le GA_3 a eu peu d'effets sur la germination des graines mais a pu supprimer avec succès la dormance de l'épicotyle de la plantule. [Traduit par le journal]


Laboratory Test No. 7 0002
Species TR Sweet Cherry
Date started OCT 05 2006
Init. B.
Unstrat
Strat 133 days
H2O soak
1) 14 day warm
2) 119 day cold
AOSA 1STA
Room
Rack
Shelf
Transfer date OCT 19 2006
FEB 14 2007
Init.
Scarify
Media Kimpak Blue Blotters Sand Metromix Other
Sub samples A, B, C, D ~~100~~ seeds each unless indicated
Seeds for x-ray
7-02

Morphological Dormancy

- Fraxinus, Ilex, – embryo not completely developed

- Pretreatments
  - afterripening
  - prechill
  - alternating prechill temps.

Secondary Dormancy

- Variety of species – impact of some undesirable condition – temperature

- Pretreatments
  - prechill
  - alternating prechill temps.

Combined/Double Dormancy

- Prunus, Quercus, Tilia – combination of any dormancy types or embryo dormancy in two places (radicle and epicotyl)

- Pretreatments
  - prechill
  - alternating prechill temps.

Other Pretreatments

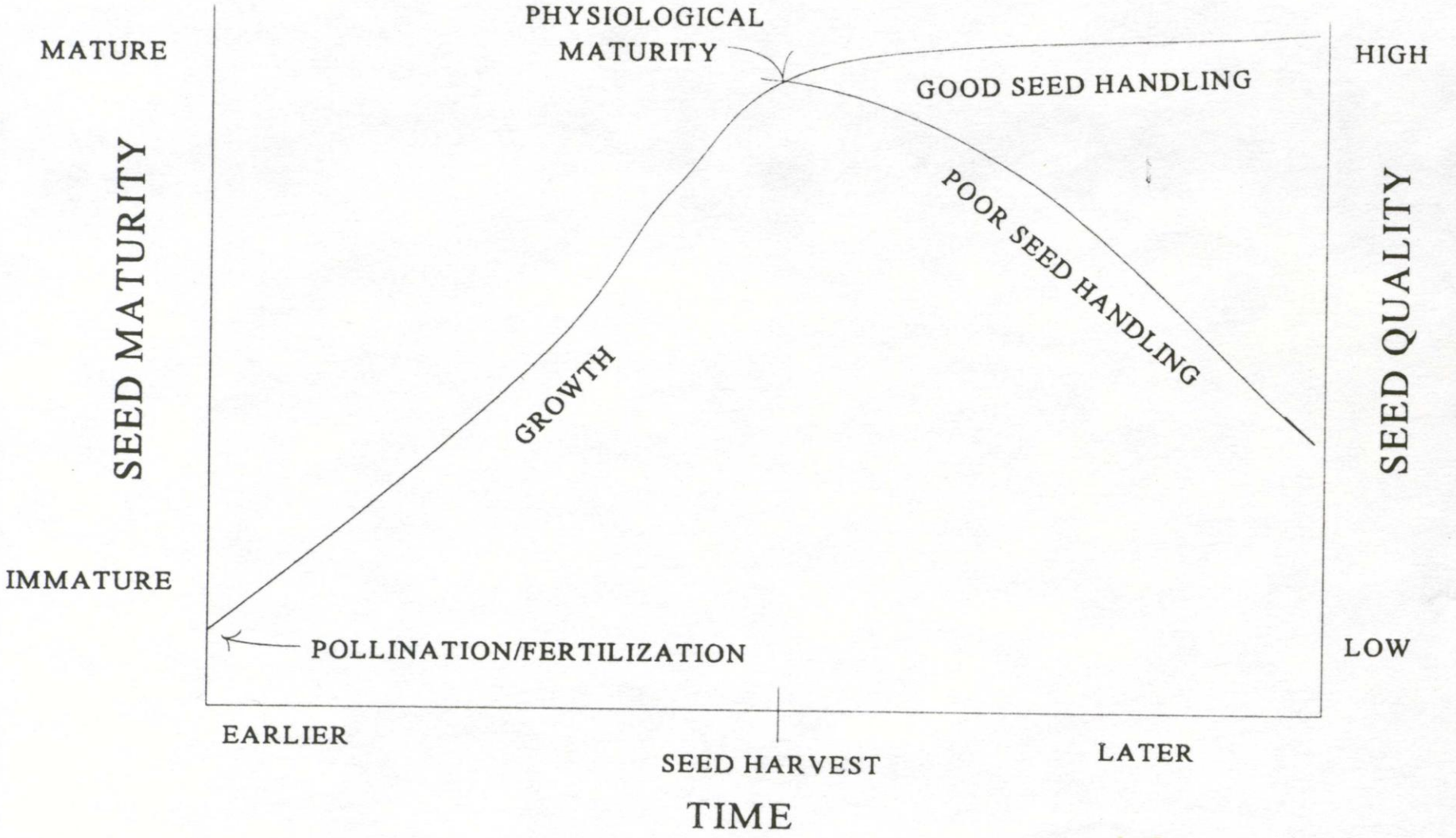
- Warm and/or cold water soak
- Chemical soak
  - H_2O_2, GA_3, citric acid, ethephon, KNO_3
- Aeration
  - speed up the physiological or metabolic changes – still done with prechill but may be able to shorten prechill time
- Medium
  - use of medium can regulate temperature and moisture
- Strat-redry
  - pretreatment and then drying to delay germination

Nursery Operations

- Schedule for pretreatment and planting – germination temperature dependant
- Sowing depth
- Mulch and water requirements – seed can dry out in the bed

Other Considerations

- Records
  - collection, processing, storage, etc.
- Contracts
- Stored Seed
- Seed tests
  - current – no more than 6-9 months old
  - plan 6-9 months ahead
- Seed production areas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