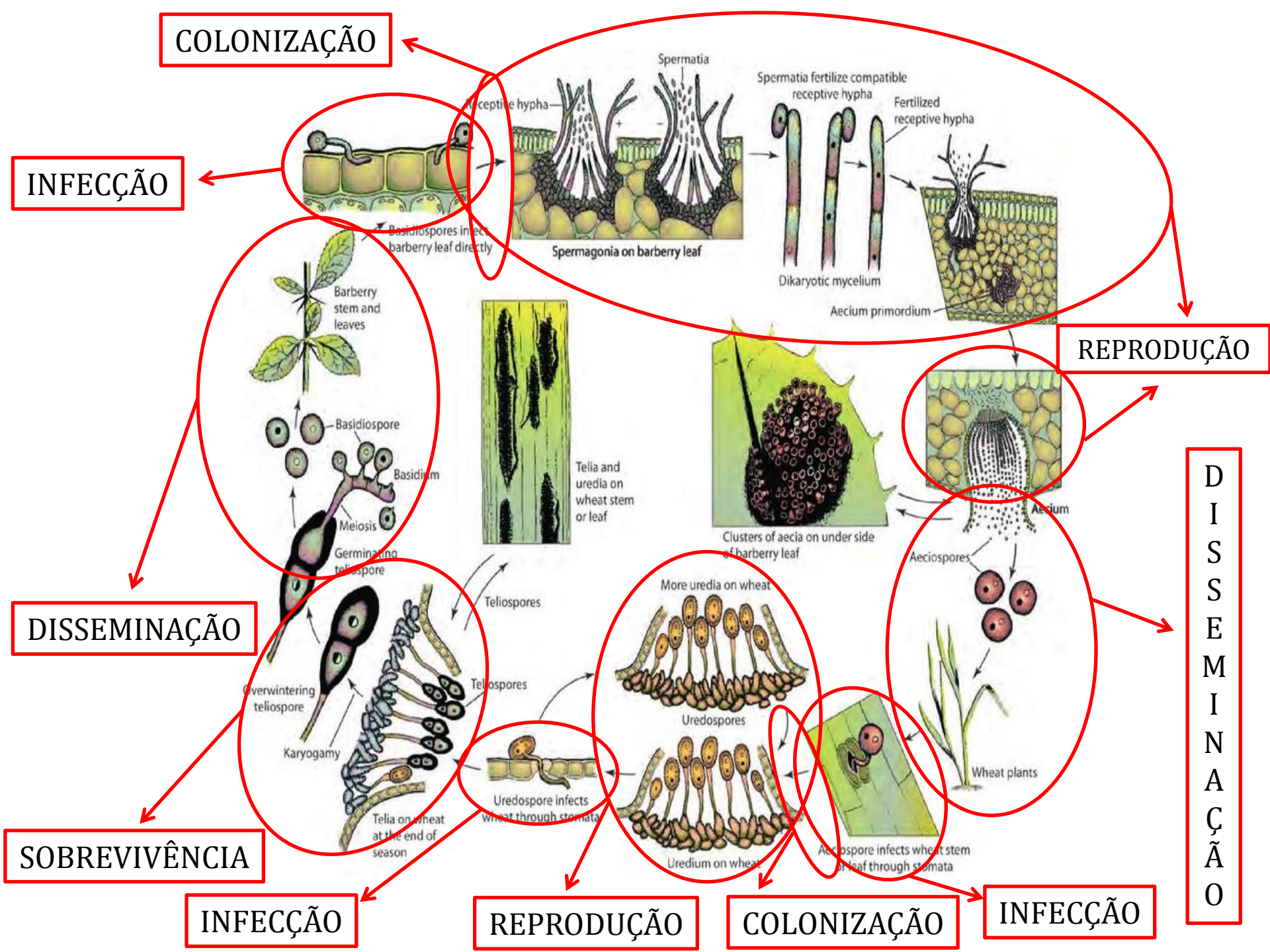
Escola Superior de Agricultura “Luiz de Queiroz” – USP
Programa de Pós-Graduação
Fitopatologia Geral
LFT 5710-1

Ciclos das relações patógeno-hospedeiro: Principais doenças no Brasil

Felipe Fadel Sartori
Jackellyne Bruna Sousa

Piracicaba – SP
Abril de 2016

Ferrugem do colmo do trigo
(*Puccinia graminis tritici*)


COLONIZAÇÃO
INFECÇÃO
DISSEMINAÇÃO
SOBREVIVÊNCIA
INFECÇÃO
REPRODUÇÃO
COLONIZAÇÃO
INFECÇÃO
REPRODUÇÃO
DISSEMINAÇÃO
Spermatia
Receptive hypha
Spermatia fertilize compatible receptive hypha
Fertilized receptive hypha
Spermagonia on barberry leaf
Dikaryotic mycelium
Aecium primordium
Basidiospores infect barberry leaf directly
Barberry stem and leaves
Basidiospore
Basidium
Meiosis
Germinating teliospore
Overwintering teliospore
Karyogamy
Telia and uredia on wheat stem or leaf
Clusters of aecia on under side of barberry leaf
Aecium
Aeciospores
Wheat plants
Teliospores
Teliospores
Telia on wheat at the end of season
Uredospore infects wheat through stomata
More uredia on wheat
Uredospores
Uredium on wheat
Aeciospore infects wheat stem or leaf through stomata

COLONIZAÇÃO

INFECÇÃO

DISSEMINAÇÃO

SOBREVIVÊNCIA

INFECÇÃO

REPRODUÇÃO

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INFECÇÃO

REPRODUÇÃO

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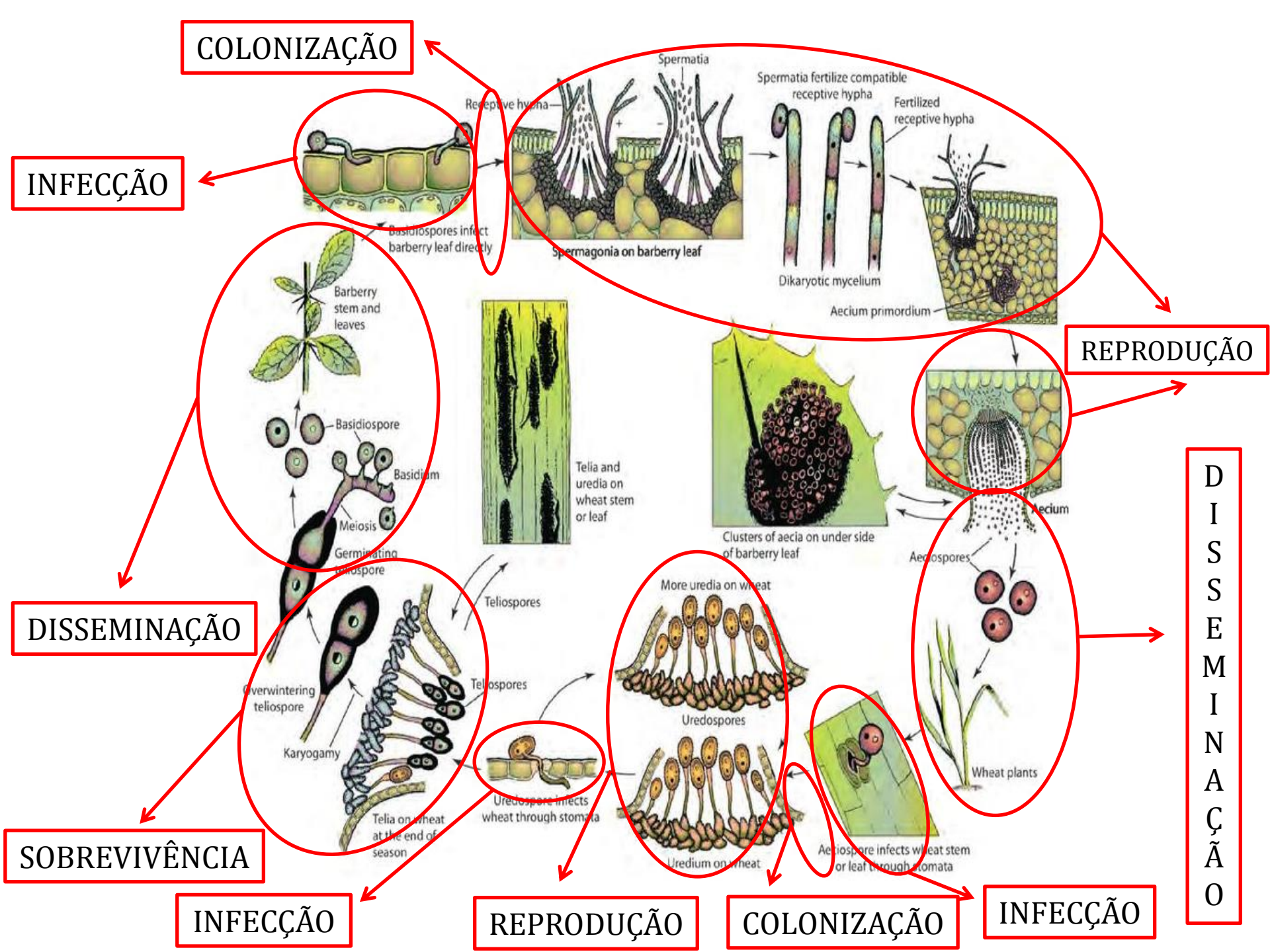

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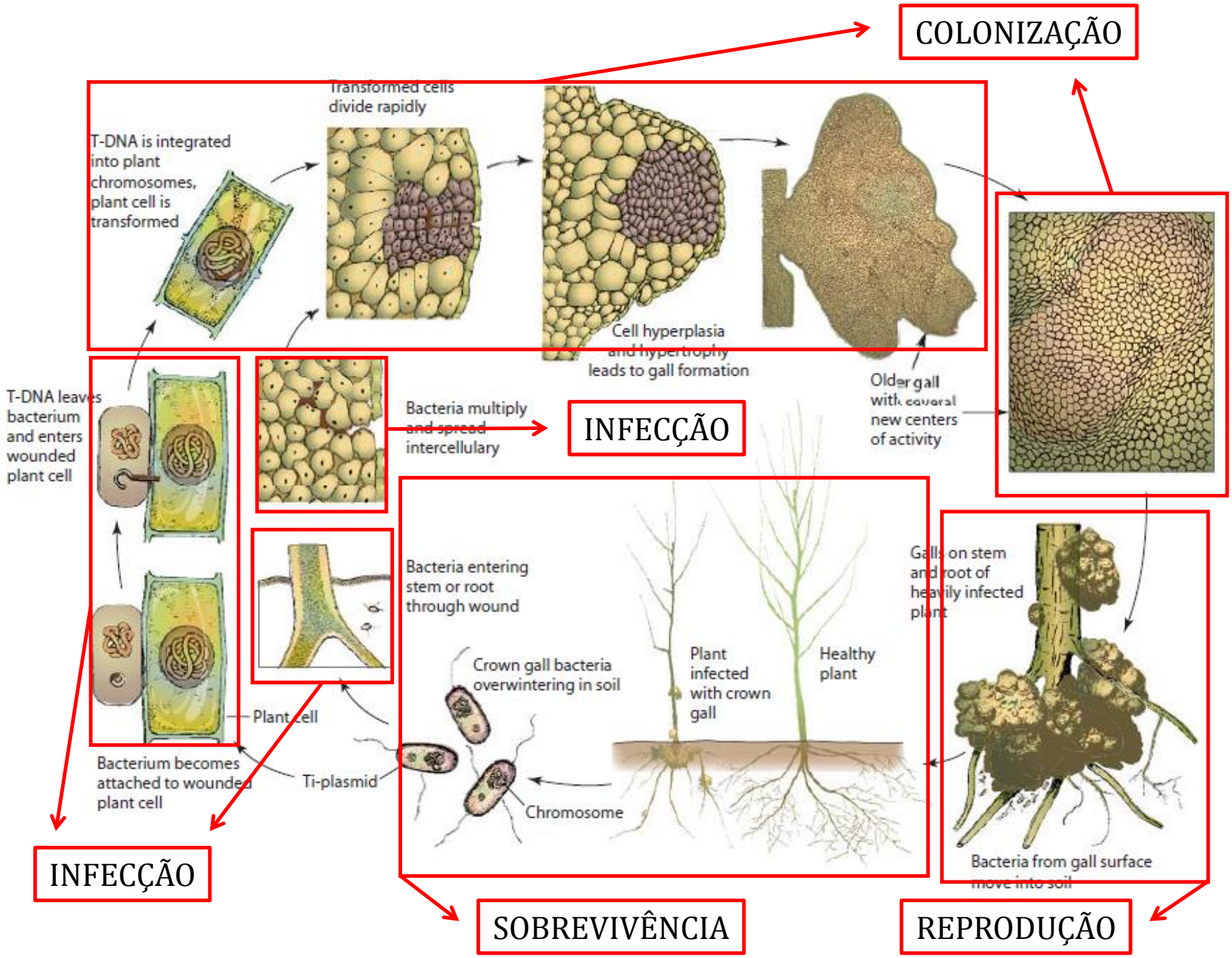
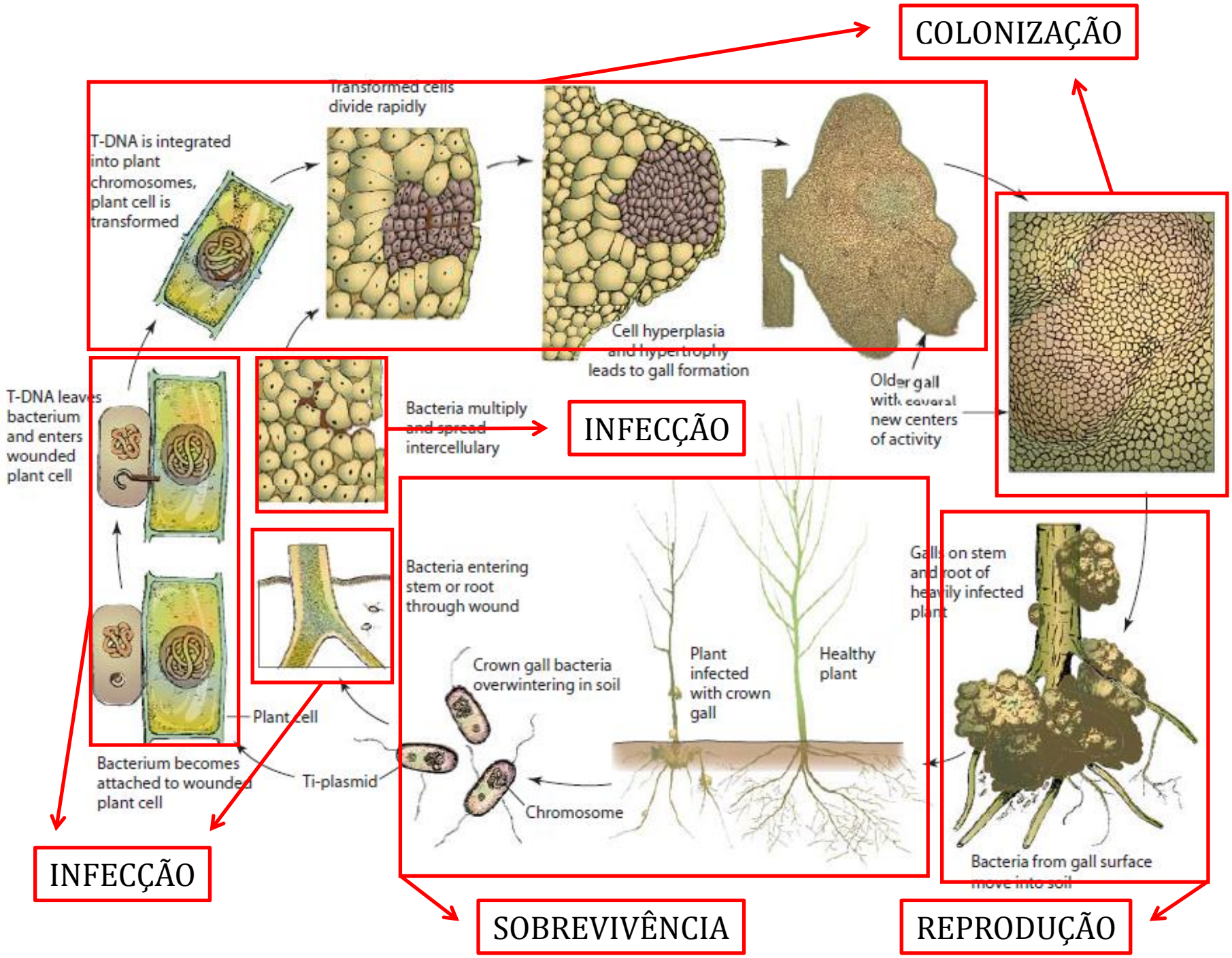
Galha da coroa de rosáceas
(*Agrobacterium tumefaciens*)


COLONIZAÇÃO
Transformed cells divide rapidly
T-DNA is integrated into plant chromosomes, plant cell is transformed
Cell hyperplasia and hypertrophy leads to gall formation
Older gall with several new centers of activity
T-DNA leaves bacterium and enters wounded plant cell
Bacteria multiply and spread intercellulary
INFECÇÃO
Bacteria entering stem or root through wound
Crown gall bacteria overwintering in soil
Plant infected with crown gall
Healthy plant
Plant cell
Bacterium becomes attached to wounded plant cell
Ti-plasmid
Chromosome
Galls on stem and root of heavily infected plant
Bacteria from gall surface move into soil
INFECÇÃO
SOBREVIVÊNCIA
REPRODUÇÃO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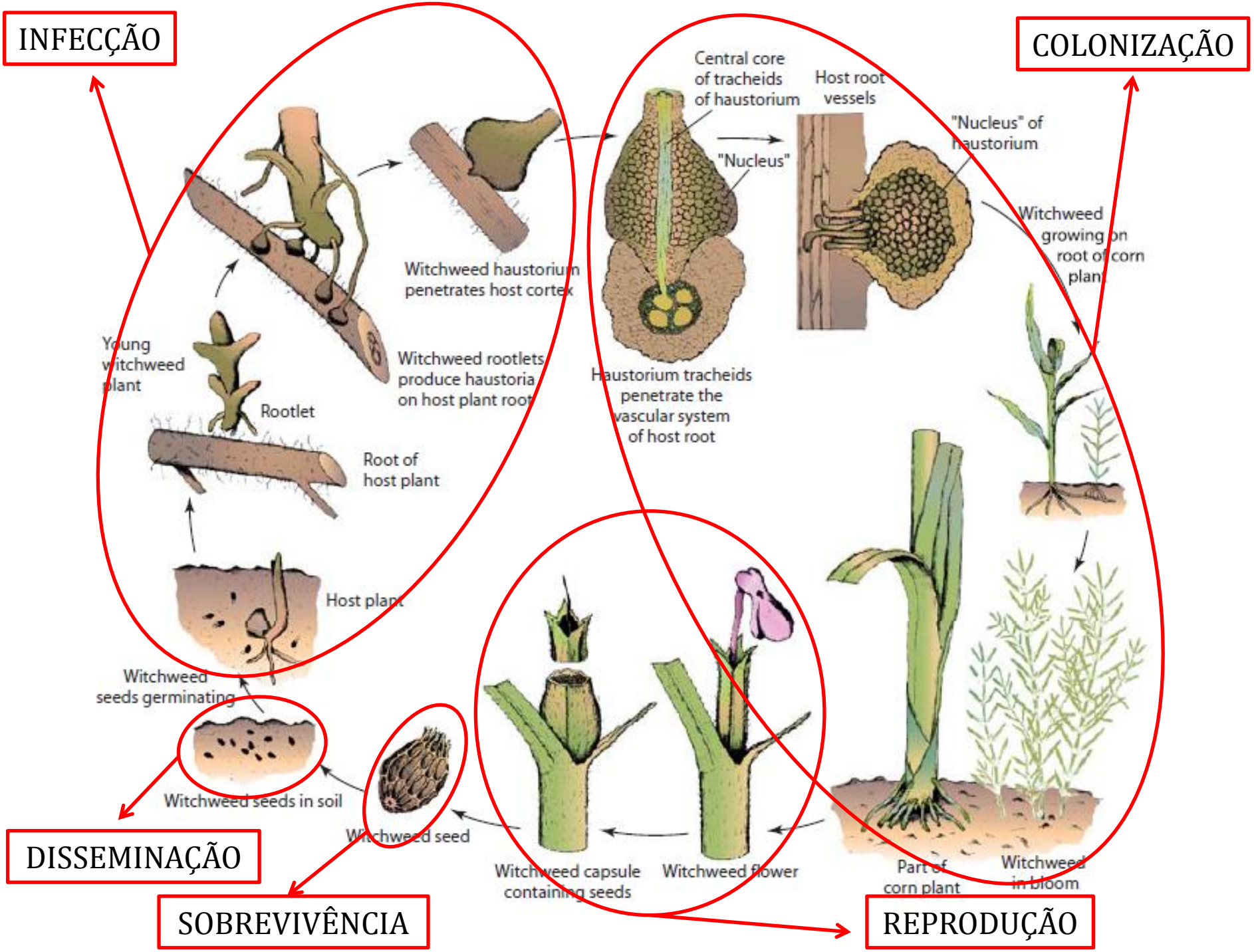
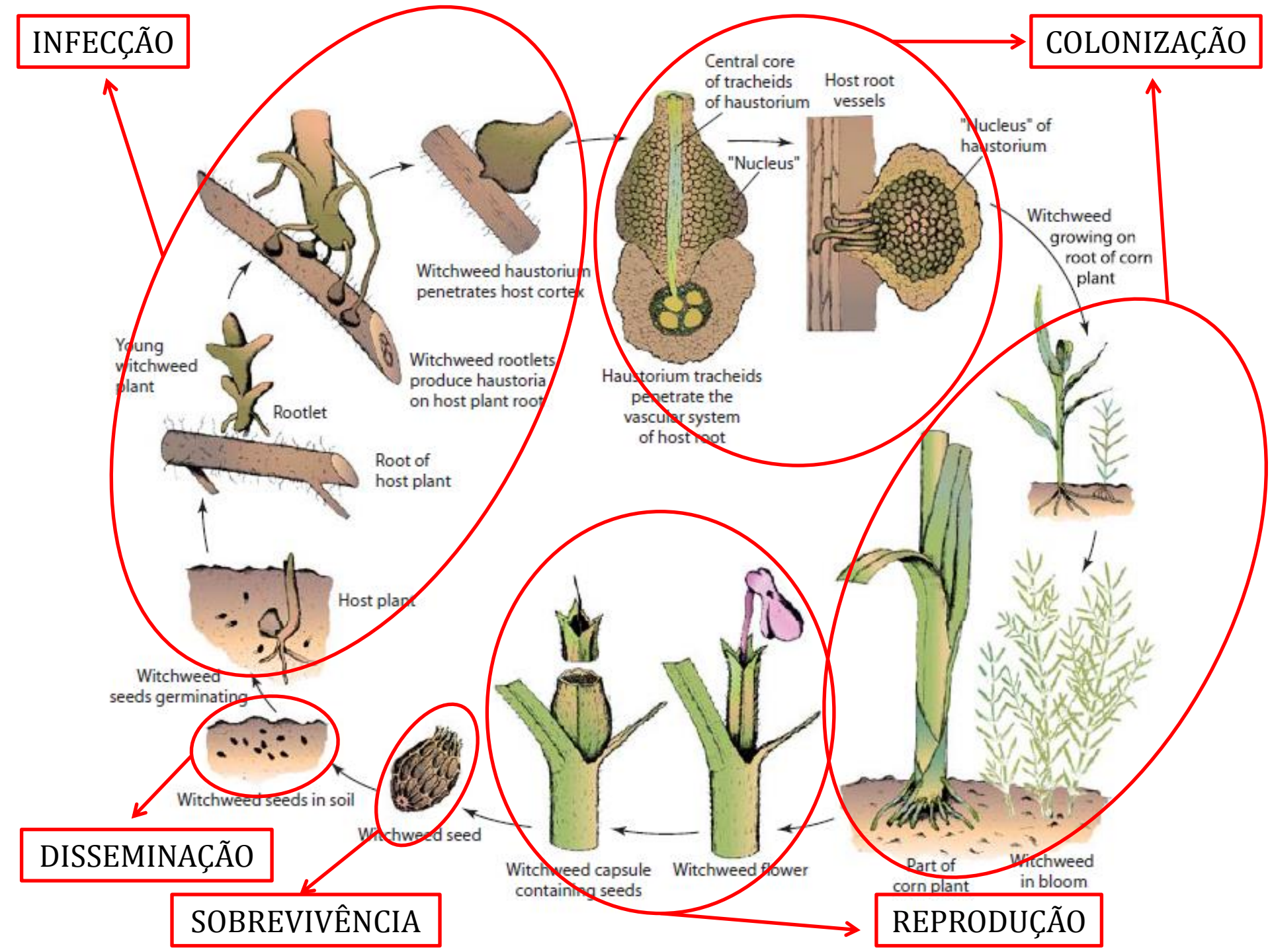
Striga asiatica no milho


INFECÇÃO
COLONIZAÇÃO
Central core of tracheids of haustorium
Host root vessels
"Nucleus" of haustorium
"Nucleus"
Witchweed haustorium penetrates host cortex
Witchweed growing on root of corn plant
Young witchweed plant
Witchweed rootlets produce haustoria on host plant root
Haustorium tracheids penetrate the vascular system of host root
Rootlet
Root of host plant
Host plant
Witchweed seeds germinating
Witchweed seeds in soil
Witchweed seed
Witchweed capsule containing seeds
Witchweed flower
Part of corn plant
Witchweed in bloom
DISSEMINAÇÃO
SOBREVIVÊNCIA
REPRODUÇÃO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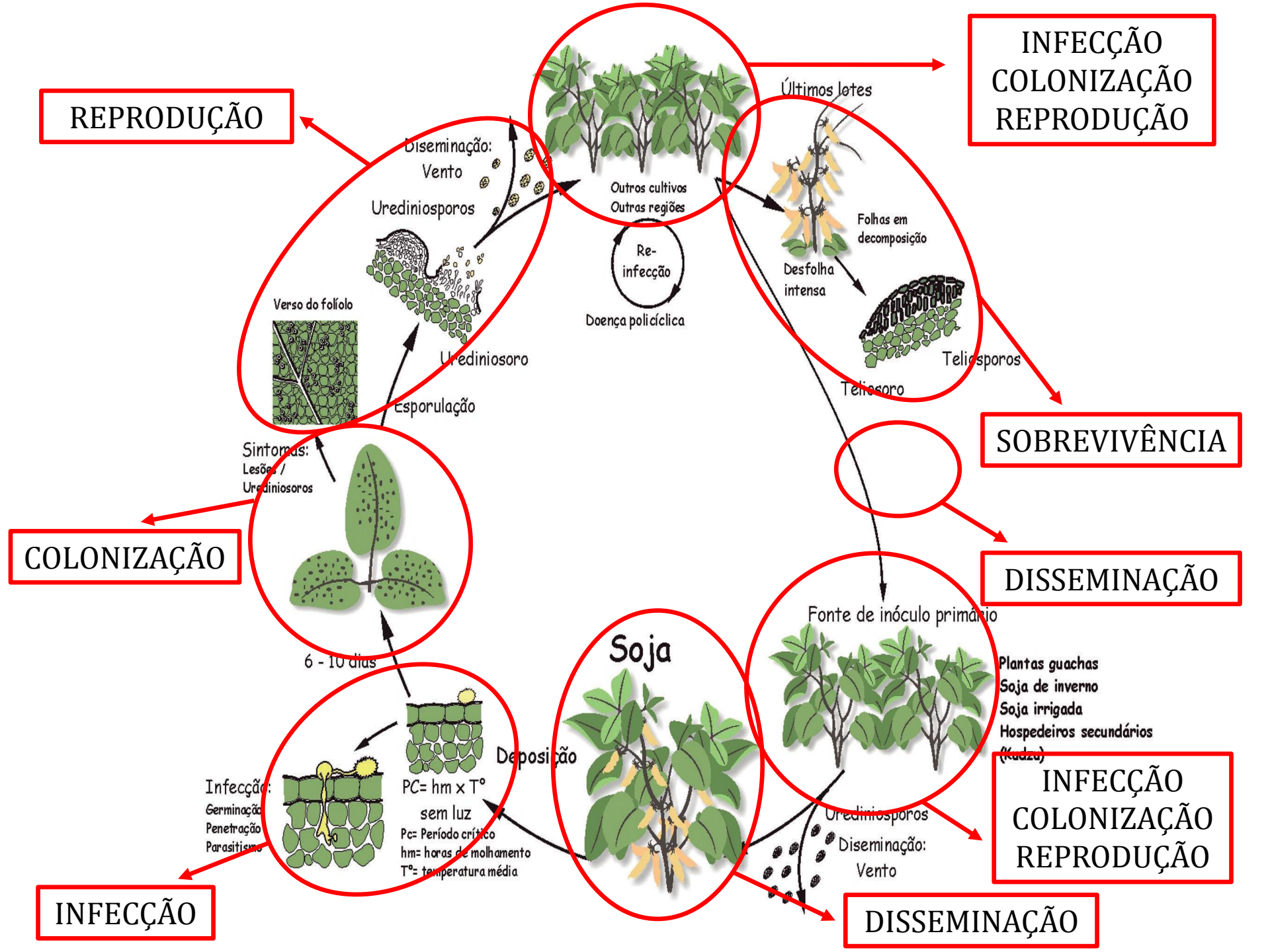
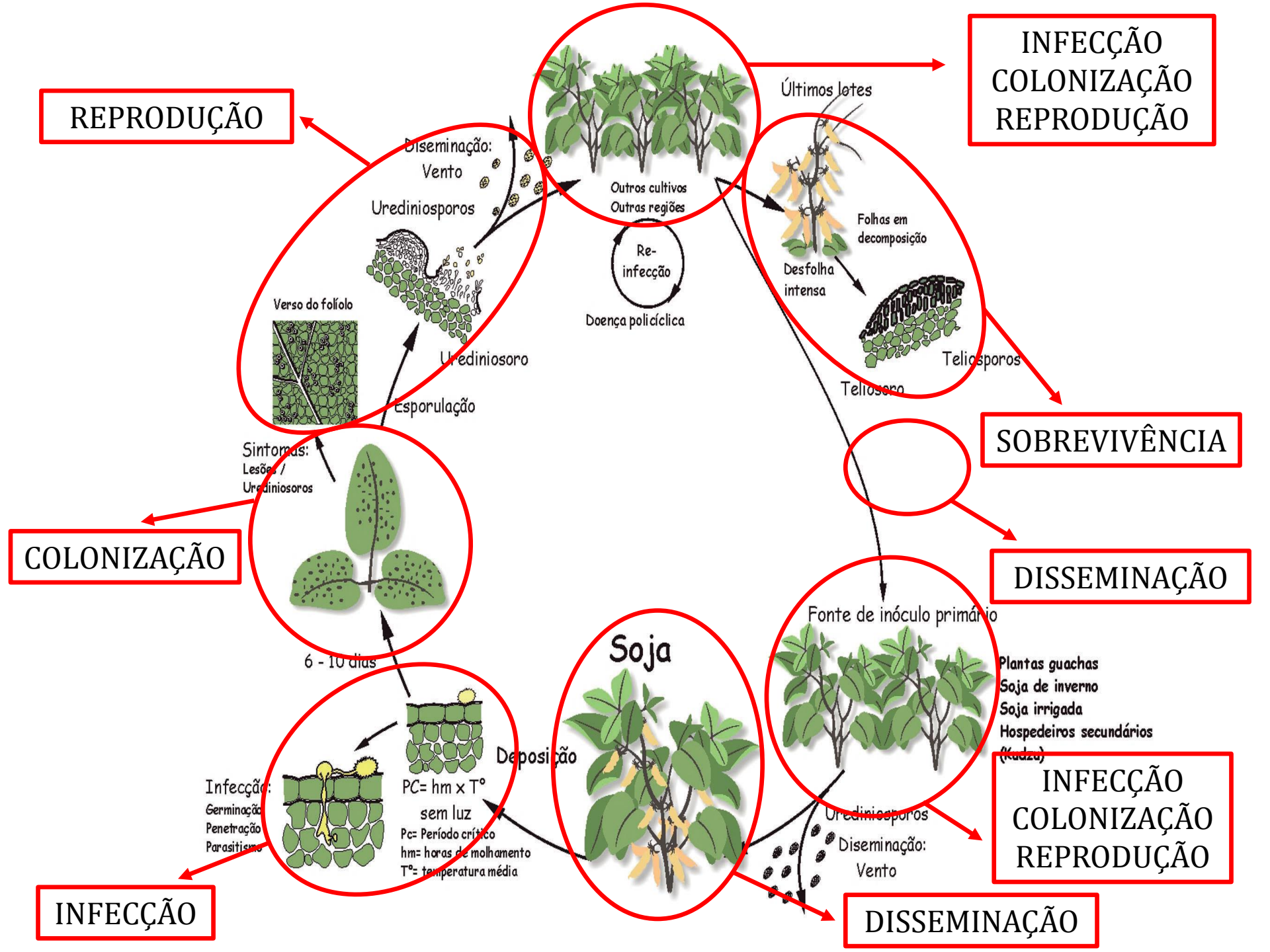
Ferrugem da soja
(*Phakopsora packyrhizi*)


INFECÇÃO
COLONIZAÇÃO
REPRODUÇÃO
REPRODUÇÃO
Últimos lotes
Disseminação:
Vento
Urediniosporos
Outros cultivos
Outras regiões
Re-
infecção
Doença policíclica
Folhas em
decomposição
Desfolha
intensa
Verso do folíolo
Urediniosoro
Esporulação
Teliosporos
Teliosoro
SOBREVIVÊNCIA
Sintomas:
Lesões /
Urediniosoros
COLONIZAÇÃO
DISSEMINAÇÃO
Fonte de inóculo primário
Soja
6 - 10 dias
Plantas guachas
Soja de inverno
Soja irrigada
Hospedeiros secundários
(Kudzu)
Deposição
Infecção:
Germinação
Penetração
Parasitismo
PC= hm x T°
sem luz
Pc= Período crítico
hm= horas de molhamento
T°= temperatura média
Urediniosporos
Disseminação:
Vento
INFECÇÃO
COLONIZAÇÃO
REPRODUÇÃO
INFECÇÃO
DISSEMINAÇÃO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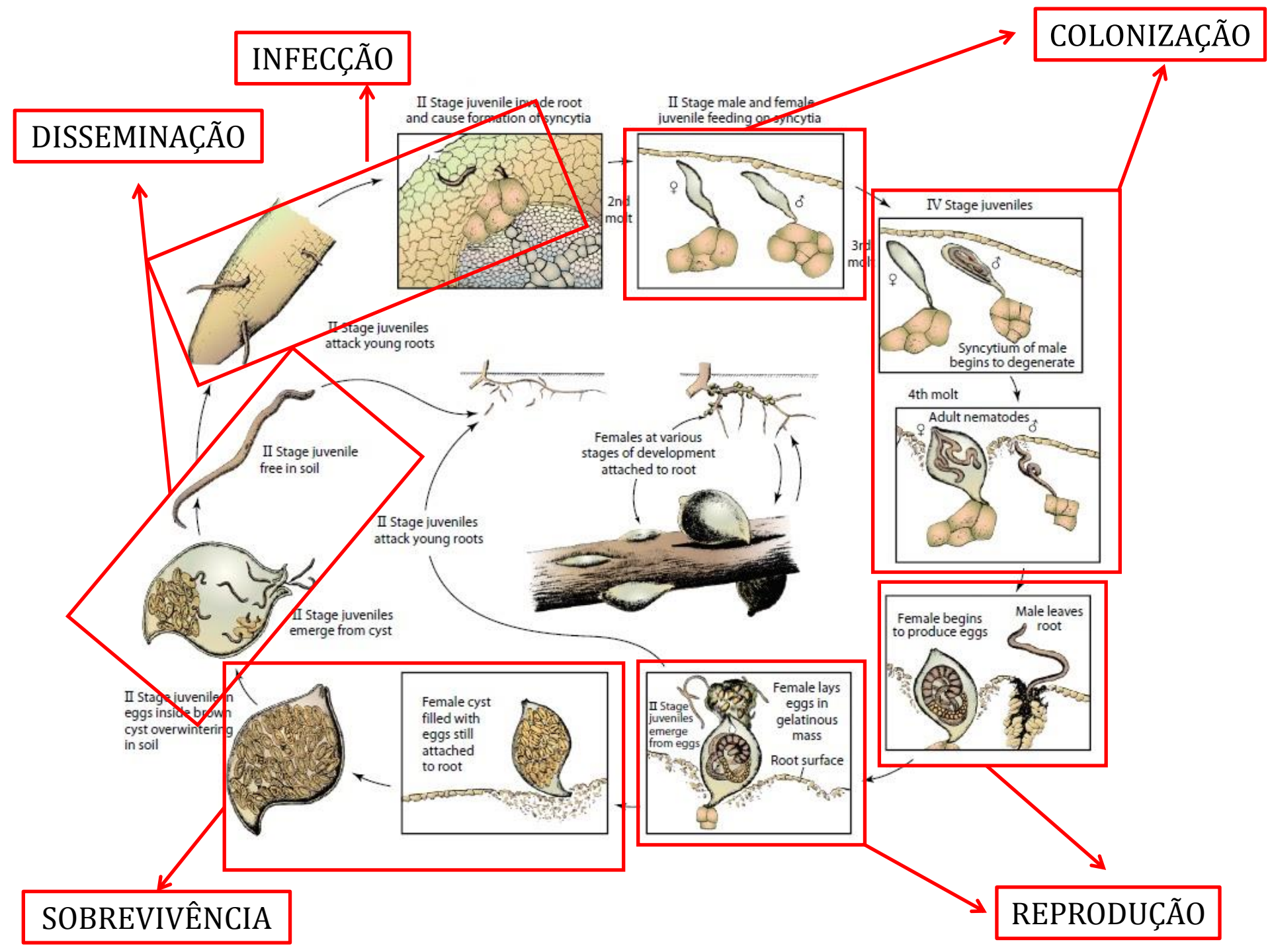
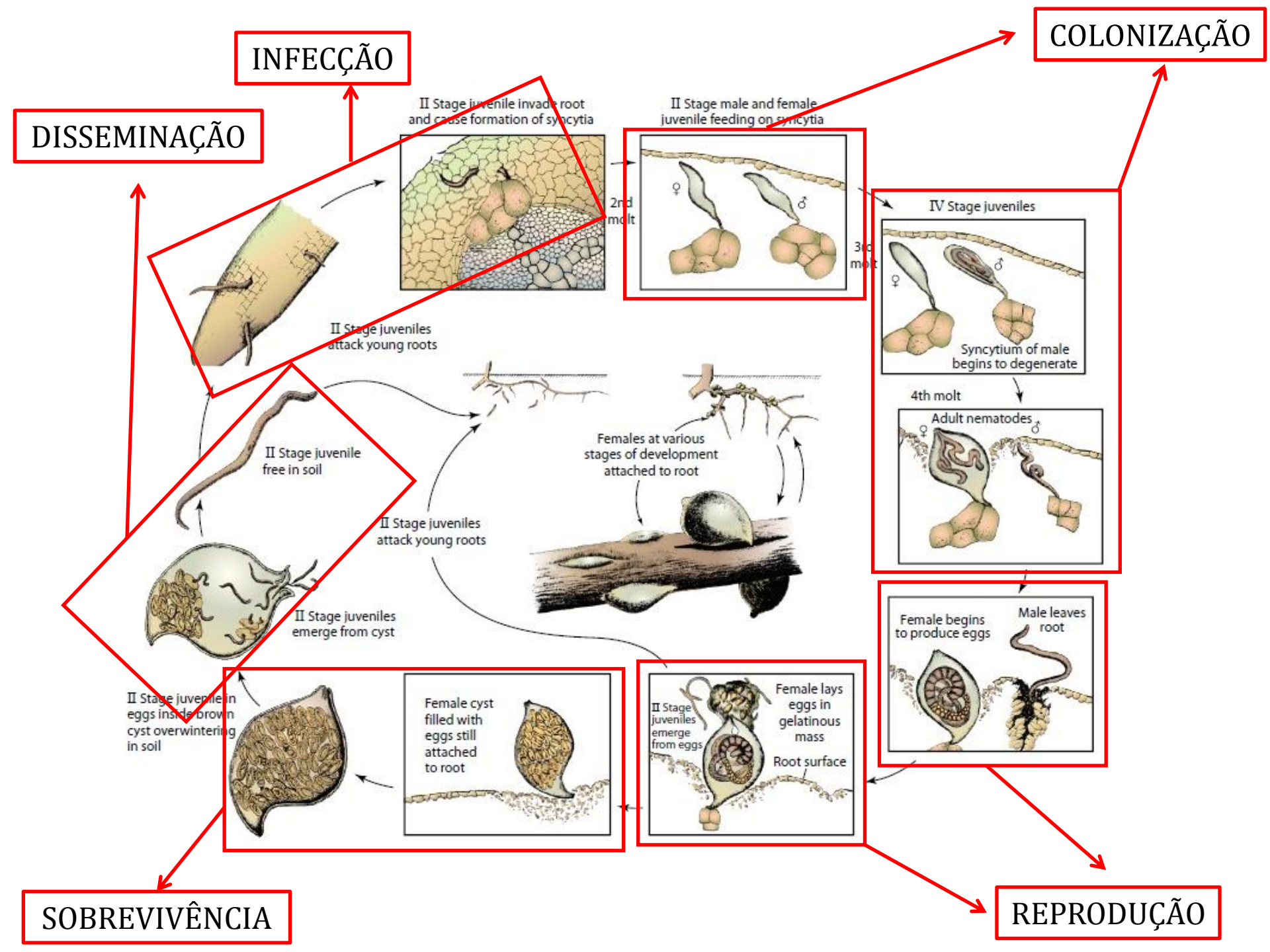
Nematóide do cisto da soja (*Heterodera glycines*)


INFECÇÃO
COLONIZAÇÃO
DISSEMINAÇÃO
SOBREVIVÊNCIA
REPRODUÇÃO
II Stage juvenile invade root and cause formation of syncytia
II Stage male and female juvenile feeding on syncytia
2nd molt
3rd molt
IV Stage juveniles
Syncytium of male begins to degenerate
4th molt
Adult nematodes
Male leaves root
Female begins to produce eggs
Female lays eggs in gelatinous mass
II Stage juveniles emerge from eggs
Root surface
Female cyst filled with eggs still attached to root
II Stage juveniles in eggs inside brown cyst overwintering in soil
II Stage juveniles emerge from cyst
II Stage juvenile free in soil
II Stage juveniles attack young roots
Females at various stages of development attached to root
II Stage juveniles attack young roots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Female cyst filled with eggs still attached to root
II Stage juveniles emerge from eggs
Female lays eggs in gelatinous mass
Root surface

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Huanglongbing dos citros
(*Candidatus* Liberibacter)

DISSEMINAÇÃO

Insect does not yet transmit pathogen

Incubation period

INFECÇÃO

Pathogen colonizes salivary glands and it is injected into new plants

Vector feeding on healthy plant transmits the pathogen

Pathogen starts to spread systemically with minor or no symptoms

Vectors overwinter as eggs or adults on hosts

COLONIZAÇÃO

Infection symptoms become more evident and plant starts to decline

REPRODUÇÃO

Healthy insect vector feeding on infected plant obtains pathogen

Pathogen is ingested and later moves into hemolymph, muscles, glands, etc.

DISSEMINAÇÃO

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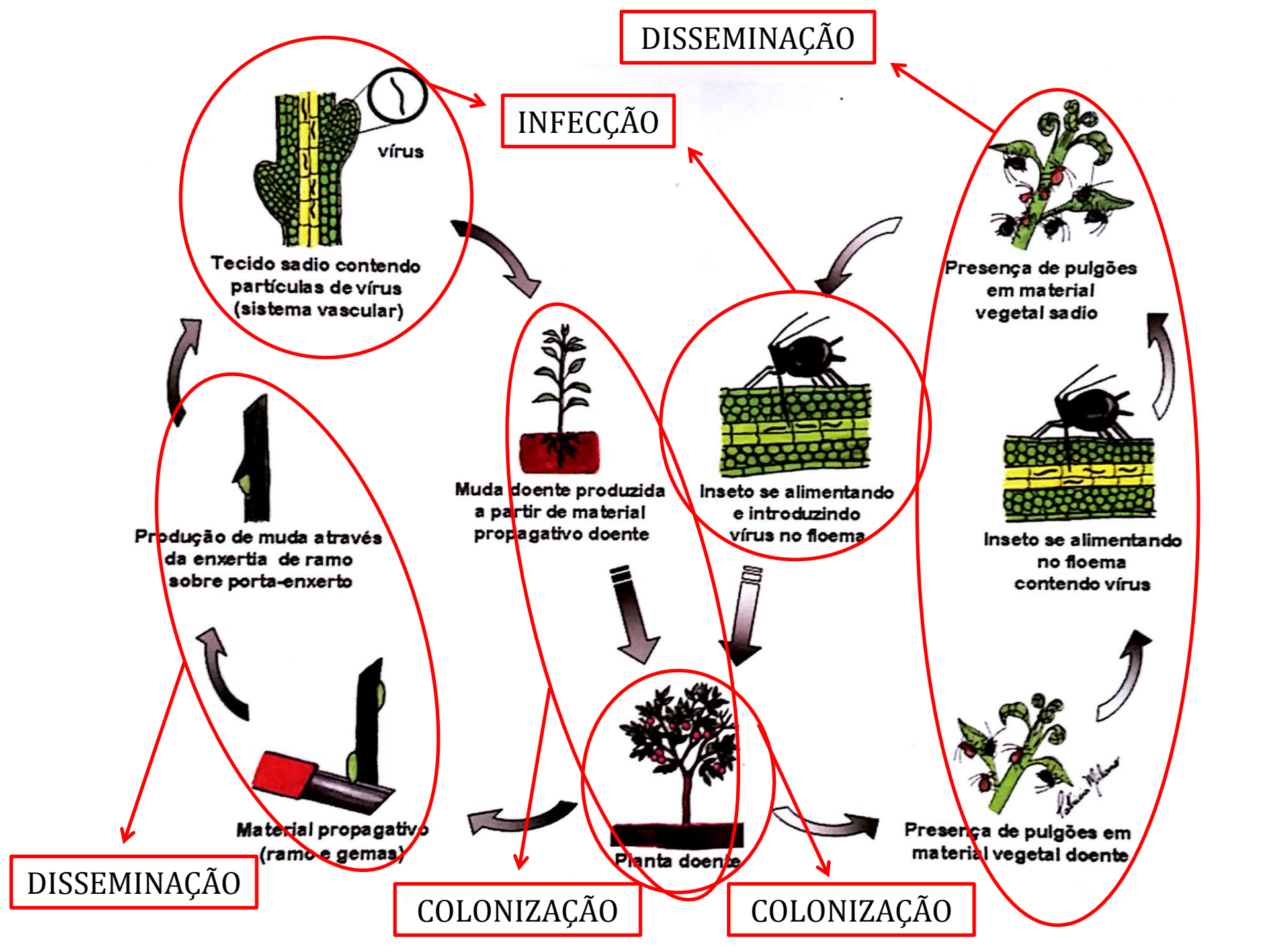
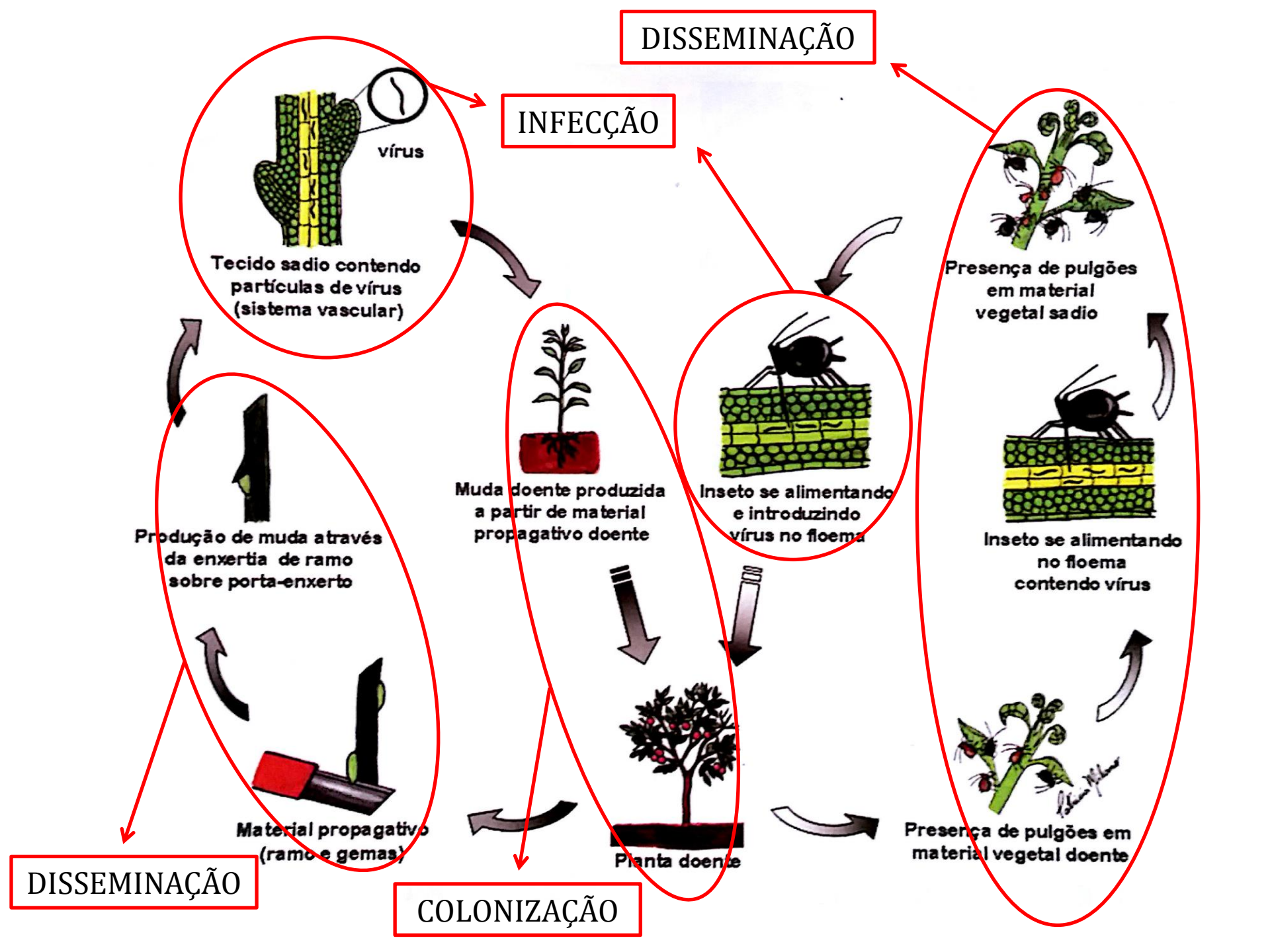
Tristeza dos citros
(*Citrus tristeza virus*)


DISSEMINAÇÃO
INFECÇÃO
vírus
Tecido sadio contendo partículas de vírus (sistema vascular)
Presença de pulgões em material vegetal sadio
Muda doente produzida a partir de material propagativo doente
Inseto se alimentando e introduzindo vírus no floema
Inseto se alimentando no floema contendo vírus
Produção de muda através da enxertia de ramo sobre porta-enxerto
Material propagativo (ramo e gemas)
Planta doente
Presença de pulgões em material vegetal doente
DISSEMINAÇÃO
COLONIZAÇÃO
COLONIZAÇÃO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COLONIZAÇÃO

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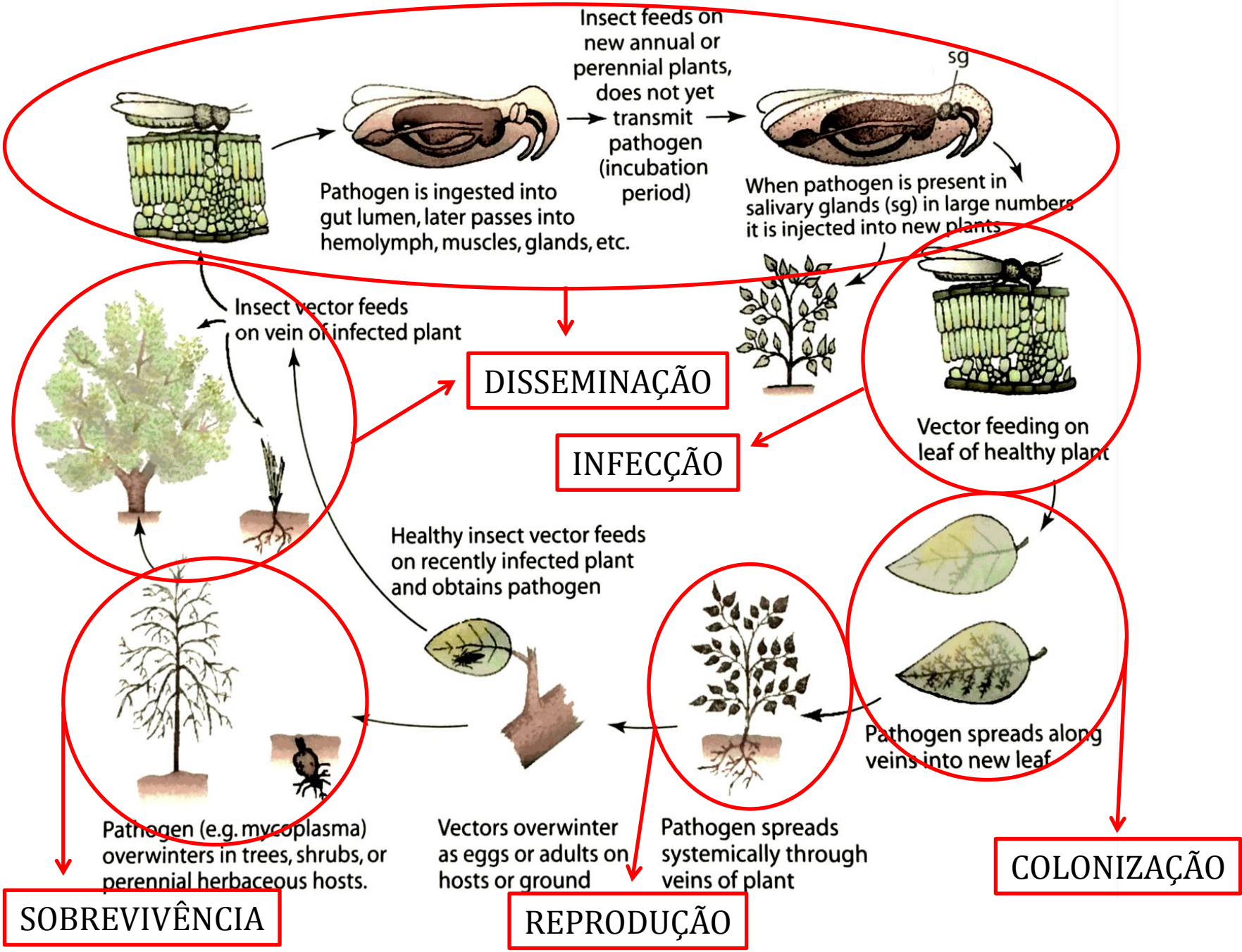
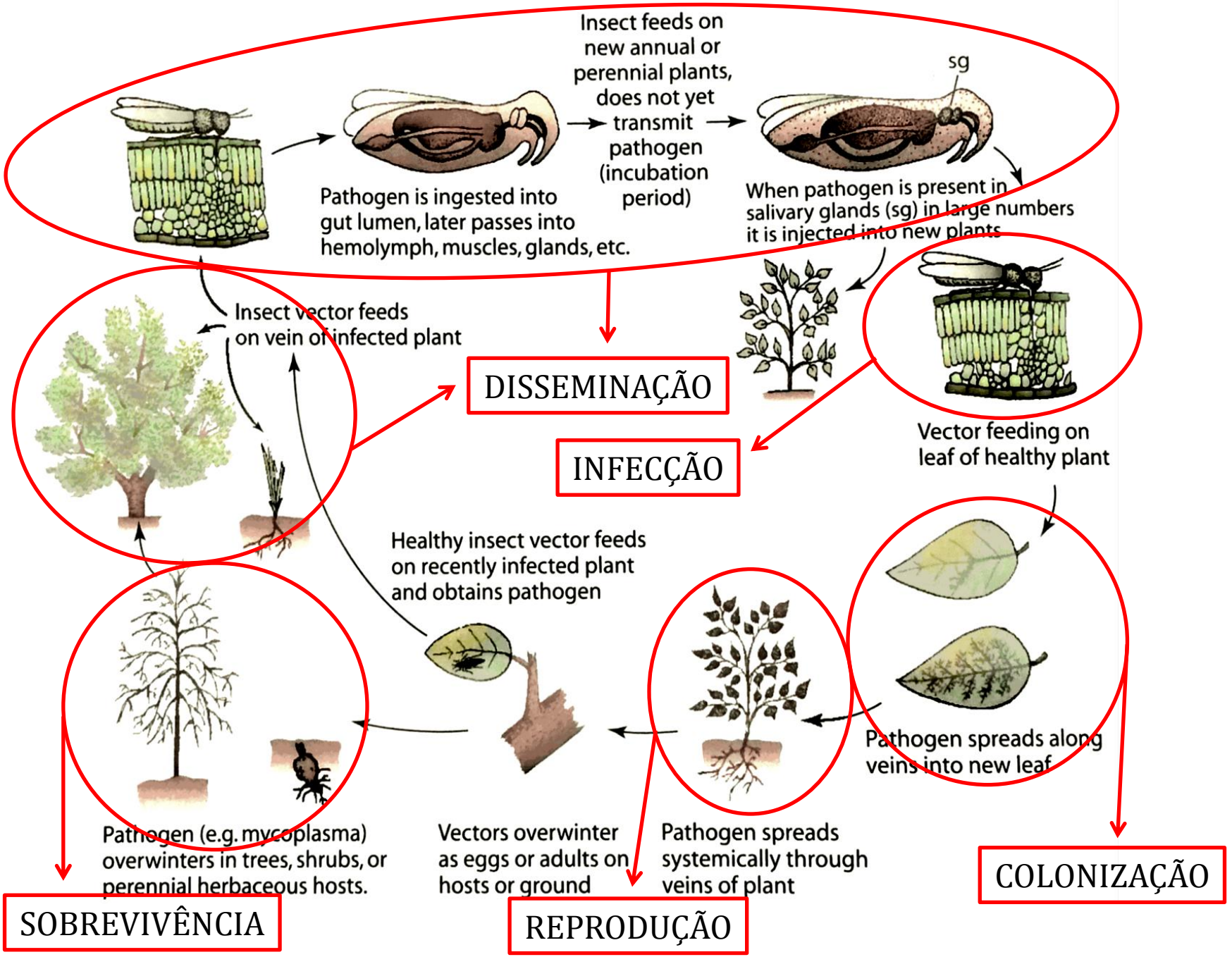
Fitoplasma


Insect feeds on new annual or perennial plants, does not yet transmit pathogen (incubation period)
sg
Pathogen is ingested into gut lumen, later passes into hemolymph, muscles, glands, etc.
When pathogen is present in salivary glands (sg) in large numbers it is injected into new plants
Insect vector feeds on vein of infected plant
DISSEMINAÇÃO
INFECÇÃO
Vector feeding on leaf of healthy plant
Healthy insect vector feeds on recently infected plant and obtains pathogen
Pathogen spreads along veins into new leaf
Pathogen (e.g. mycoplasma) overwinters in trees, shrubs, or perennial herbaceous hosts.
Vectors overwinter as eggs or adults on hosts or ground
Pathogen spreads systemically through veins of plant
SOBREVIVÊNCIA
REPRODUÇÃO
COLONIZAÇÃO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