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Impossibility of Seed Transmission In Plant Mycoplasmal Diseases.

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植物마이코플라스마病의 種子傳染 不可能性

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ABSTRACT

Seed transmission in plant mycoplasmal diseases has never been reported. Some evidences supporting impossibility of seed transmission in plant mycoplasmal diseases are discussed.

INTRODUCTION

Prior to discovery of mycoplasmalike organisms inplants, the following two principles in relation to seed transmission of viruses were generally recognized. (1)Viruses that give evidence of causing symptoms that arise primarily in the phloem, or other parts of the vascular system, appear not to be seed-transmitted, and (2) singular subject leafhopper-transmitted virus is known not to be seed-transmitted. We now recognize that phloem-limited viruses are viruses or mycoplasmalike organisms or rickettsialike organisms, and the xylem-limited viruses appear to be rickettsialike organisms. Also, most of leafhopper-borne viruses are now known to be mycoplasmalike organisms or rickettsialike organisms.

As far as the author knows, there have been no examples of seed transmission of mycoplasmalike organ isms. Also there has been no logical explanation about the question—"Why no seed transmission in MLO-incited diseases?" This paper proposes that mycoplasmalike organisms in plants cannot be seed-transmitted.

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Failure in Seed Formation

There is a great deal of literature about no seed formation in most of the plants infected by mycoplasmalike organisms. Phyllody, sterility, and abortion are very common symptoms in most plant mycoplasmal diseases and they are associated with failure of seed formation.Floral part differentiation is rare or absent on axillary shoots where excessive and premature development of dormant buds occurs. Premature death in case of early infection also acts as an obstacle for seed formation. Nut dropping is known in case of lethal yellowing of coconut palms. Sudden death by infection of mycoplasmalike organisms within the season is not rare in young trees as well as herbaceous plants. If the rice plant become infected by rice yellow dwarf agents, they often die or produce defective

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head or remain without heads.

No Way for Mycoplasma to Invade the Embryo

Mycoplasmalike organisms that are necessarily phloem-limited in plant hosts cannot be introduced into the embryo, for there are no vascular connections between the embryo and the mother plant. Also even no plasmodesmata have been seen between the embryo sac and the endothelium, while a double cuticle occurs between the two.

When an embryo is initiated by union of nuclei in an embryo sac, there apparently are no protoplasmic connections between cells of embryo and cells of adjacent tissue. The embryo becomes essentially a parasitic structure able to grow and de velop through absorption of nutrients from the mother plant. The wall of the embryo sac may bear wall ingrowths indicating transfer activity of nutrients into the embryo.

Pollen thansmission of viruses is, though rare, known to occur, e.g. prune dwarf virus in cherry, apple cholorotic leaf spot virus in respberry, and some other viruses. Ontogenically pollen grains are perfectly isolated from a vascular bundle which is continued as a single bundle in the filament and anther. In other words, mycoplasmalike organisms cannot be transported into the pollen grains. Therefore the embryo is free from invasion of mycoplasmalike organisms,before and after pollination.

Survival of MLOs in/on Seed?

Though it will probably be confirmed sooner or later whether transport of mycoplasmalike organisms into the endosperm occurs or not, there is apparent vascular connection between the endosperm and the mother plant. If mycoplasmalike organisms are transported into the endosperm, can they survive with the seed? Mycoplasmalike organisms will lose viability soon. Because it seems to be no doubt that mycoplasmalike organisms are nutritionally exacting and osmotically sensitive as true mycoplasms.Further no resting stage is known.

Many plant pathogens including fungi, bacteria, and viruses can be seed-borne as contaminants on the seed coat. Mycoplasmalike organisms only occur intracellularly in plant hosts. It seems unlikely that these intracellular organisms can be seed-borne as contaminants. Even though mycoplasmalike organisms may be seed-contaminants, they cannot survive. In other words, mycoplasmalike organisms cannot be seed-transmitted even in case they are seed-contaminated.

CONCLUSION

The seed transmission of mycoplasmalike organisms in plant seems to be impossible. Firstly, failure in seed formation is common in plant mycoplsmal diseases. Secondly, there is no passage way for mycoplasmalike organisms to the embryo. Thirdly, even though the mycoplasmalike organisms are transported into the endosperm, they will loss viability soon. Fourthly, they cannot be seed-borne as contaminants due to lack of resting stage.

Here the author additionally suggests the future research projects on plant mycoplasmal diseases with special reference to seed of host plant.

(1) Are mycoplasmalike organisms transported into the endosperm in their plant host?

(2) Do mycoplasmalike organisms give an effect on seed before and after reaching the endosperm?

(3) Cause of sterility, production of defective seed, and no heading which are already suggested by others should be supported with more understanding.

摘 要

마이코플라스마類似微生物이 植物에서 病原體로 確認되기 以前에는 이른바 維管束侵害바이러스病과 매미虫類에 依해 媒介傳染되는 바이러스病들은 大部分 혹은 全部 種子傳染이 안된다는 것이 通論으로 되어왔다. 그러나 이들 範疇의 植物病들은 大部分 마이코플라스마類似微生物에 依한 것으로 밝혀지고 있다.

現在까지 마이코플라스마類似微生物의 種子傳染이 確認된 例는 없으며 또한 種子傳染의 可否를 論한 報告도 없다. 本 稿는 몇 가지 證據를 提示하면서 마이코플라스마類似微生物의 種子傳染不可能性을 主張한다.

첫째, 大部分의 植物마이코플라스마病은 葉化現象, 不姙, 急激한 枯死 等을 일으켜서 種子形成이 아니된다.

둘째, 胚芽 및 花粉粒은 維管束과 隔離되어 形成된다.

셋째, 마이코플라스마는 胚乳나 種皮 等에서 內部·外部感染體로서 그 生命力을 維持할 수 없다.

넷째, 마이코플라스마는 休眠態를 갖지않는다.

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