Chapter

Nucleus

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Abstract

In our application of AuNPs on the leaf surface, we were pushing the Barley Yellow Dwarf Virus (BYDV-PAV) source and Gold nanoparticles (AuNPs) into the plant cell system up on the events of systemic plant defense response. In the infected host cell, the viral coat protein is the first obvious in the cytoplasm. When nanoparticles are applied on leaf surfaces, a large surface area relative to their volume happens. AuNPs solutions are more active and dispersed ooplasm. The correlation between Zeta potential value and Zeta sizer is inverse proportion. Filaments are visible in the nucleopores, the nuclear outline is distorted, and massive clumping of heterochromatin begins as declared. It was mostly found in or around regions of ribosome-associated filaments. Our present study combines TEM and nucleus content in the presence of AuNPS to explore the level of repair mechanism illustrating in TEM micrographs, showing Polyploidy nucleus and segregated chromatin. Multi membranous structure, imaging the AuNPs inside and around the nucleus and Pseudo crystal array is enveloped in an endoplasmic reticulum cisterna (ER).

Keywords: Nucleus, Barley Yellow Dwarf Virus (BYDV-PAV), Gold nanoparticles (AuNPs), Mechanically inoculation, Inclusions body, Segregated chromatin, Polyploidy nucleus, Spindle shape, Endosomes, Multi membranous structure, Rhombic crystal array

1. Introduction

The study succeeded in inducing BYDV-PAV infection mechanically [1] on the surface. Negative staining preparation for Electron Microscopy is used for staining virus particles and the morphological and cytological side of healthy (**Figure 1**) and treated leaves [2]. It is proposed that coat protein is expressed by cytoplasmic ribosomes from viral RNA coat protein found in the nucleus during later stages of infection probably diffused into the nucleoplasm after disruption of the nuclear membrane as evident in **Figure 2**; virus particles were then also numerous in the pockets of the nucleoplasm as shown in **Figures 2(B)** and **3(A)** and **(C)**. The studied virus revealed in ultrastructure preparations characteristic performance in the infected tissue of barely plant, crystalline array, numerous slender filamentous shape inclusions, as in **Figure 5(A)–(C)**, proteinous content, amorphous material, some cytoplasmic components which take irregular shape and inclusion bodies as appeared in **Figure 6(A)** and **(B)**. These Cytopathic effects of BYDV-PAV resemble the same as [3], who studied the ultrastructure of infected cells and confirm the restriction of BYDV-PAV to phloem parenchyma, companion cells, and sieve elements of leaves. As long as the value of the surface potential of AuNPs in mv is high,

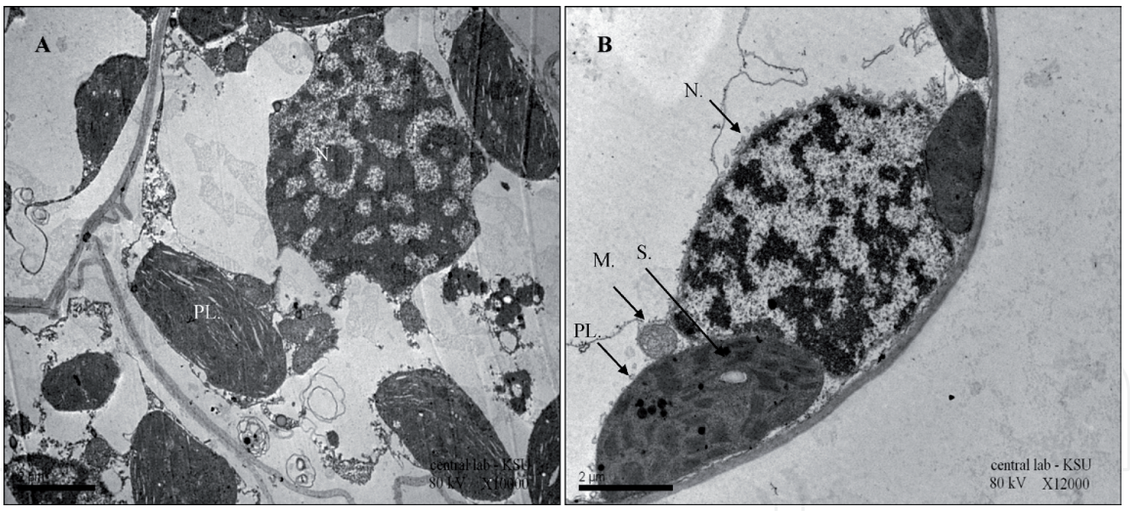

Figure 1.
High-resolution transmission electron microscopy imaging a general view of Hordeum vulgare; *barley healthy cells from leaves. (A and B) The left and right nucleus view of barley cell incubated with a single nucleus with different magnification (10000, 12000 kV). Scale bar 2 µm. The solid arrows indicate nucleus (N), chloroplast (PL), starch granules (S). Scale bar 2 µm.*

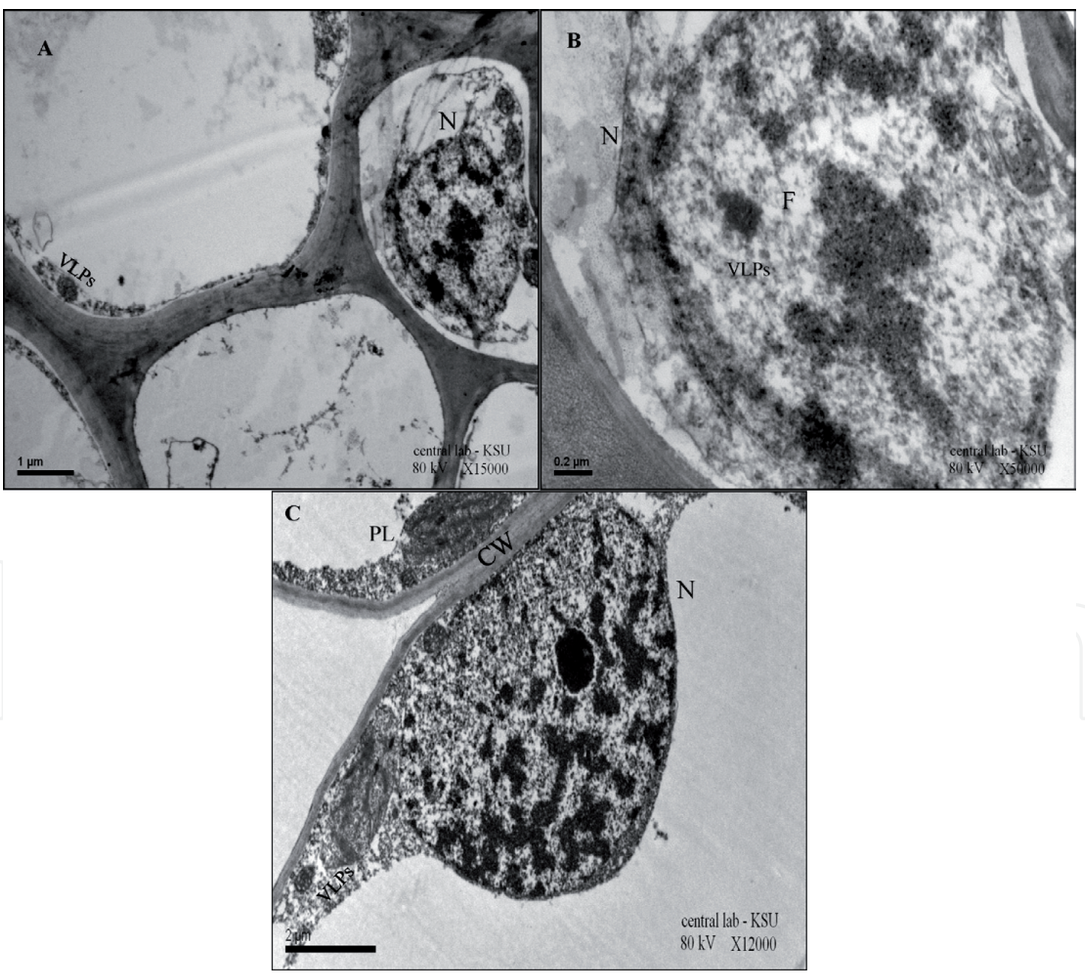

Figure 2.
Transmission electron micrographs showing deformation of the nucleus from infected leaves by barley yellow dwarf virus (BYDV). (A) A general view inside the cells showed the large nucleus and nucleolus with segregated distinct chromatin. Scale bar 1 µm. (B) a higher magnification (50000, 12000 kV) of the previous picture A scale bar 0.2 µm. (C) Showed segregated chromatin of the nucleus beside the cell wall. Scale bar 2 µm.

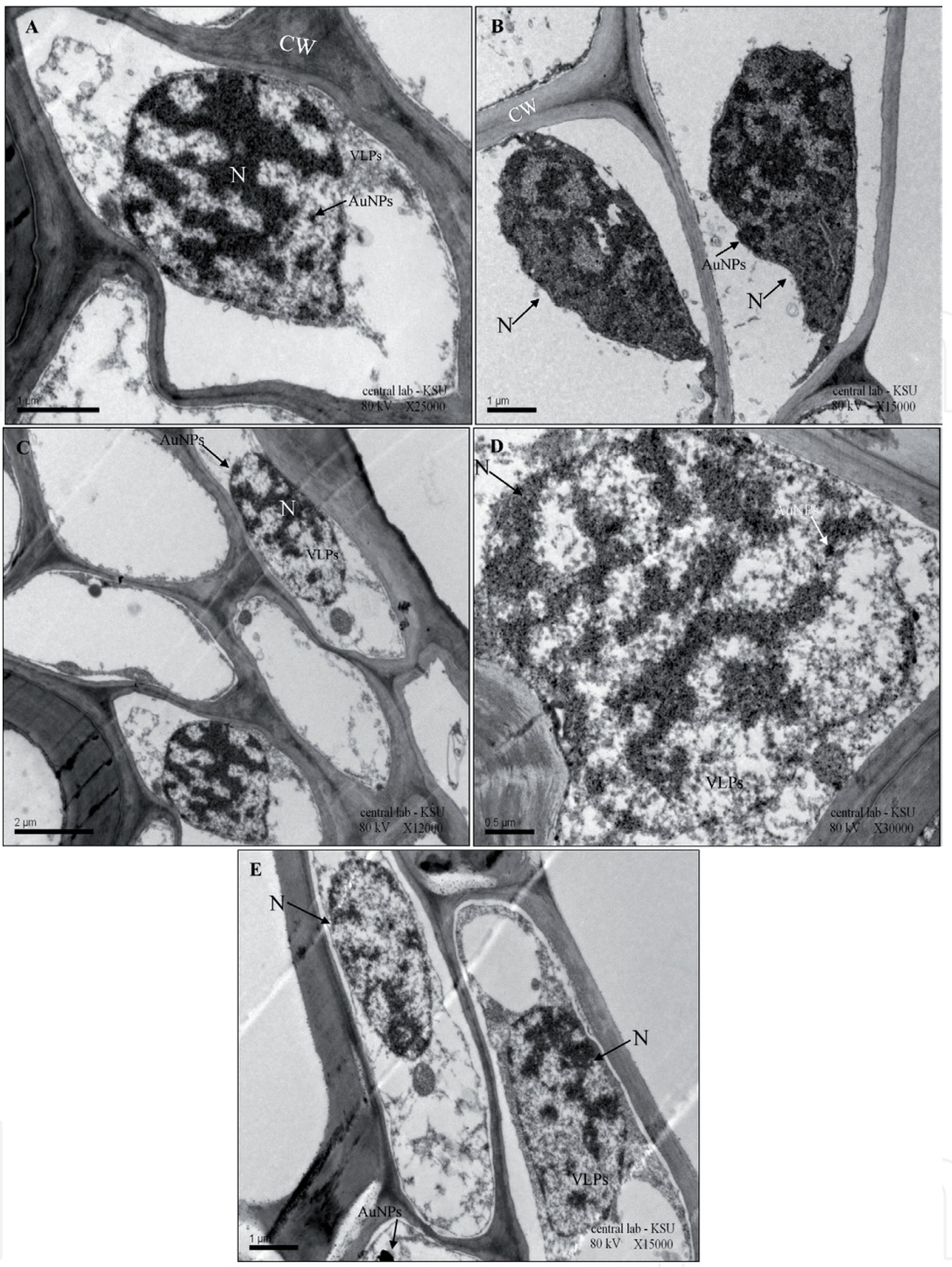

Figure 3.
Polyploidy nucleus and segregated chromatin (showing the lighter staining and partially eroded heterochromatin). (A) Different shaped of polyploidy nucleus and segregated chromatin infected with the virus (VLPs) and pretreated with gold nanoparticles (AuNPs). Scale bar 1 µm. (B) Spindle shape (arrows). Scale bar 1 µm. (C) Perpendicular shape (arrow). Scale bar 2 µm. (D) Abnormal shape of the nucleus, spindle shape (arrow). Scale bar 1 µm. (E) Abnormal shape of the nucleus; ovule shape (arrow) with more isolated chromatin. Scale bar 0.5 µm.

the solutions could be colloids/AuNPs.sol. The tiny size of nanoparticles means they exhibit enhanced or different properties compared with the bulk material, **Figure 4(A)–(D)**. Nanoparticles also enter through the stomata openings or the bases of trichomes and then translocated to various tissues mentioned.

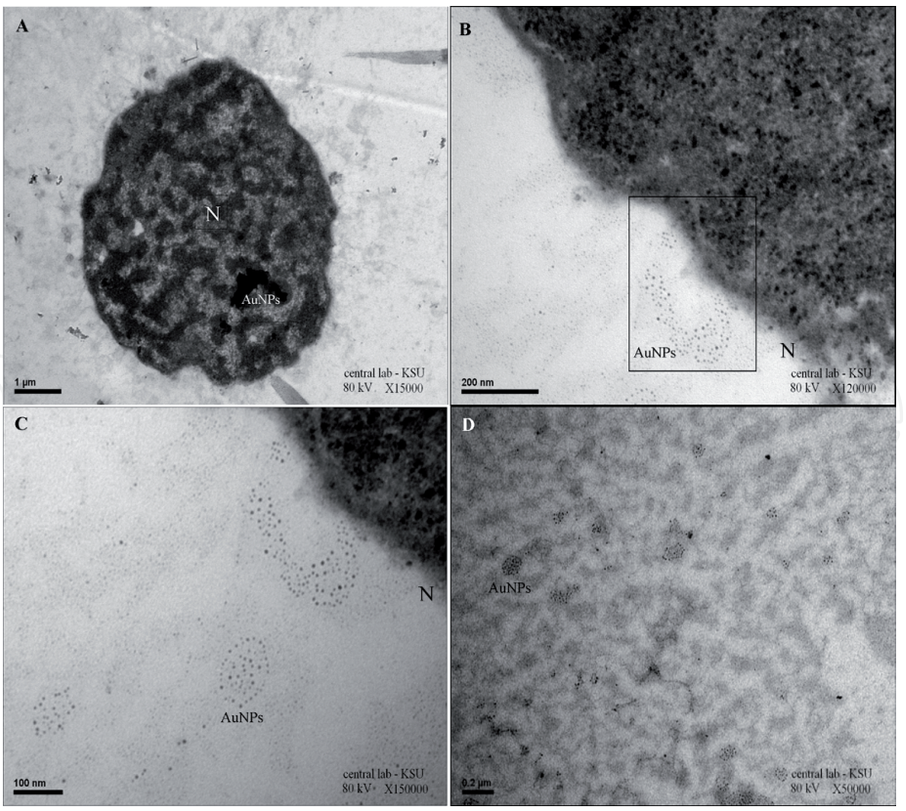

Figure 4.
Transmission electron microscopy imaging the AuNPs inside the nucleus*. (A and B) Micrograph of the polyploidy rounded nucleus filled with AuNPs. Scale bar 1 µm. (B and C) Transmission electron microscopy imaging the AuNPs around the nucleus. A micrograph of the organization of the AuNPs inside the cells, AuNPs gathering irregularly around the nucleus. Scale bar 200 nm, 100 nm. (D) Highly existence of AuNPs around the nucleus. Scale bar 0.2 µm.*

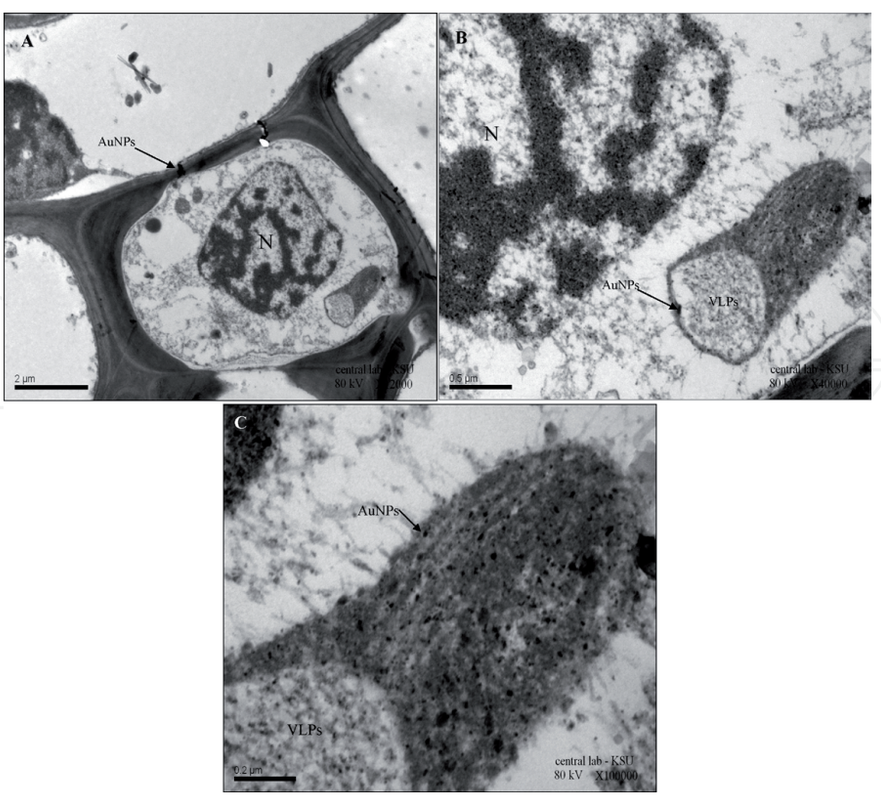

Figure 5.
Micrographs of pseudo crystal array which is enveloped in an endoplasmic reticulum cisterna (ER)*. (A) Abnormal shape of the nucleus with a perpendicular line with more isolated chromatin. Pseudo crystal array near the nucleus. Scale bar 2 µm. (B) Higher magnification of the previous picture A. Scale bar 0.5 µm. (C) Micrograph of higher magnification for rhombic crystal array contains a lot of AuNPs and VLPs inside the crystal. Scale bar 0.2 µm.*

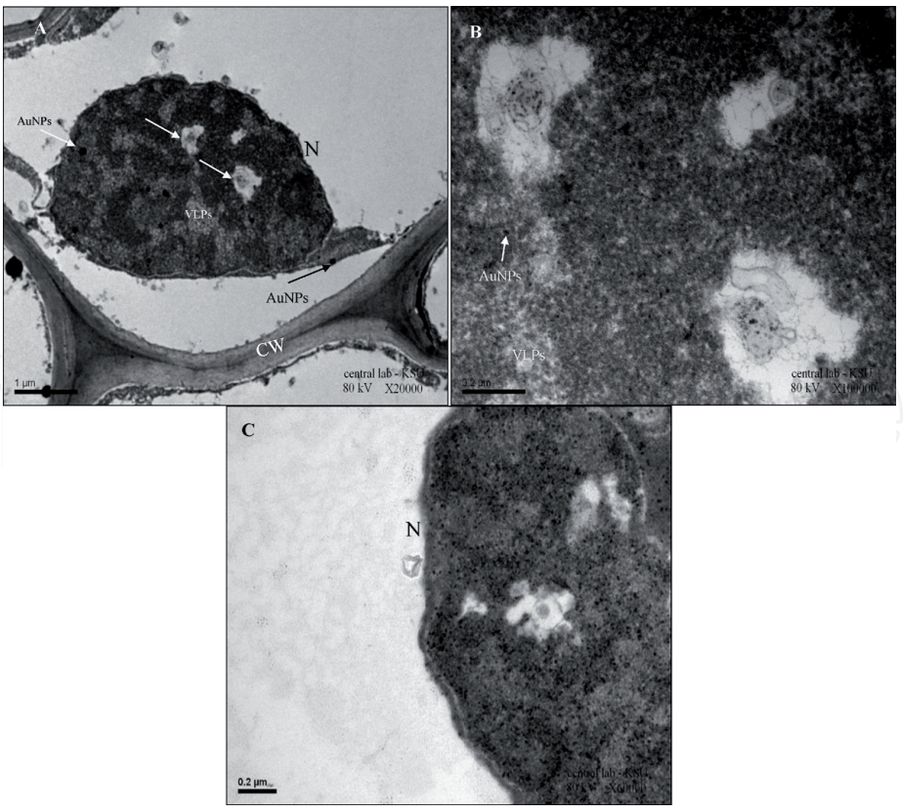

Figure 6.
Multi membranous structure. *(A) Micrograph inside the spindle nucleus has a multi membranous structure contains bodies like endosomes (arrows). Scale bar 1 µm. (B) a higher magnification (20000, 100000 kV) of these bodies. Scale bar 0.2 µm. (C) a higher magnification (6000 kV) of the irregular distribution of the chromatin with empty spaces inside the nucleus having some vacuoles. Scale bar 0.2 µm.*

2. Hyper polyploidy nucleus

Three phases of infection were defined based on alternation in the cytoplasm (early phase), nucleus (intermediate), **Figure 2(B)** and **(C)**, and both (late). The significant changes during infection with BYDV-PAV begin with the appearances of densely staining material in plasmodesmata, amorphous substance, and filaments, vesicles in the cytoplasm [3]. They suggested that the cytoplasm is the site of coat protein expression and viral assembly. At the end of the early stage, filaments are visible in the nucleopores as shown in **Figure 6(B),** During the intermediate, the nuclear outline is distorted, and massive clumping of heterochromatin begins as declared in **Figure 3**. In the present study, it was noticed in massive hyper polyploidy nucleus conjugated with the application of AuNPs in many treatments, **Figure 3(A)–(D)**.

Abbreviations

AuNPs	Gold nanoparticles
BYDV-PAV	Barley Yellow Dwarf Virus
RNA	RiboNucleic Acid
N	Nucleus
S	Starch
PL	Plastid
OG	Osmophilic Globule
MLB	Myelin like bodies

G	Grana
VLPs	Virus-like particles
CW	Cell Wall
SG	Starch granules.
IRR.S	Irregular starch granules

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