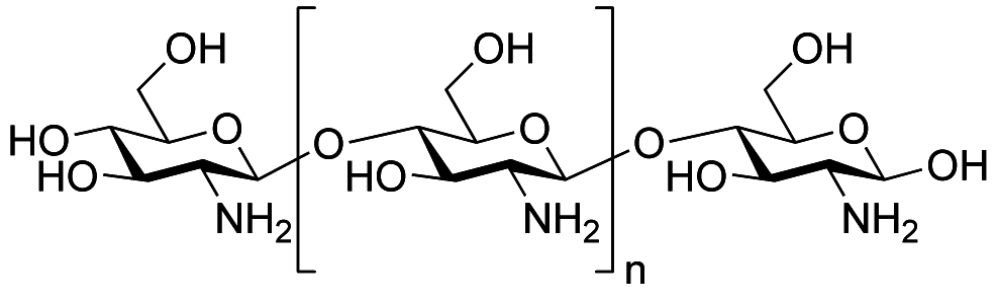
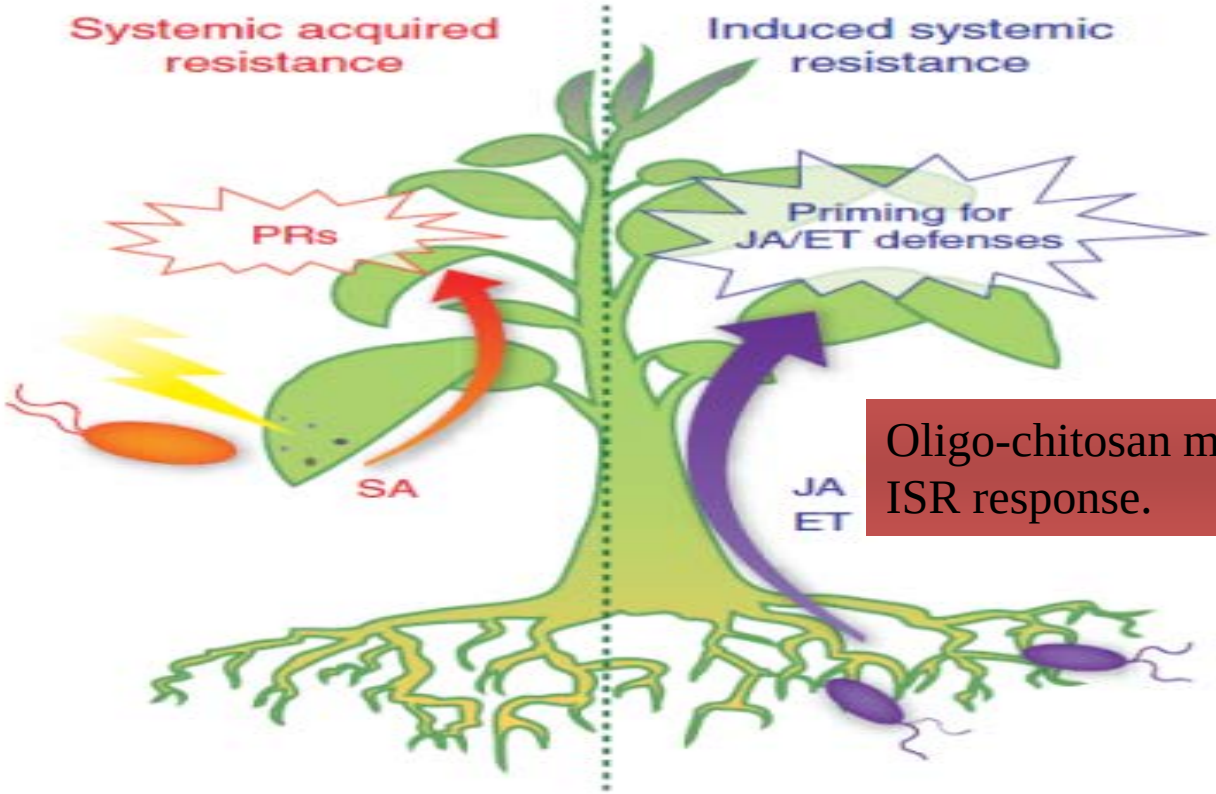
4. Evaluation of Synergy Effect between Biofertilizer and Irradiated Oligochitosan

Dr. Machi proposed that it is necessary and promising to study the combination of biofertilizer and oligo-chitosan which has been developed by FNCA radiation processing project.

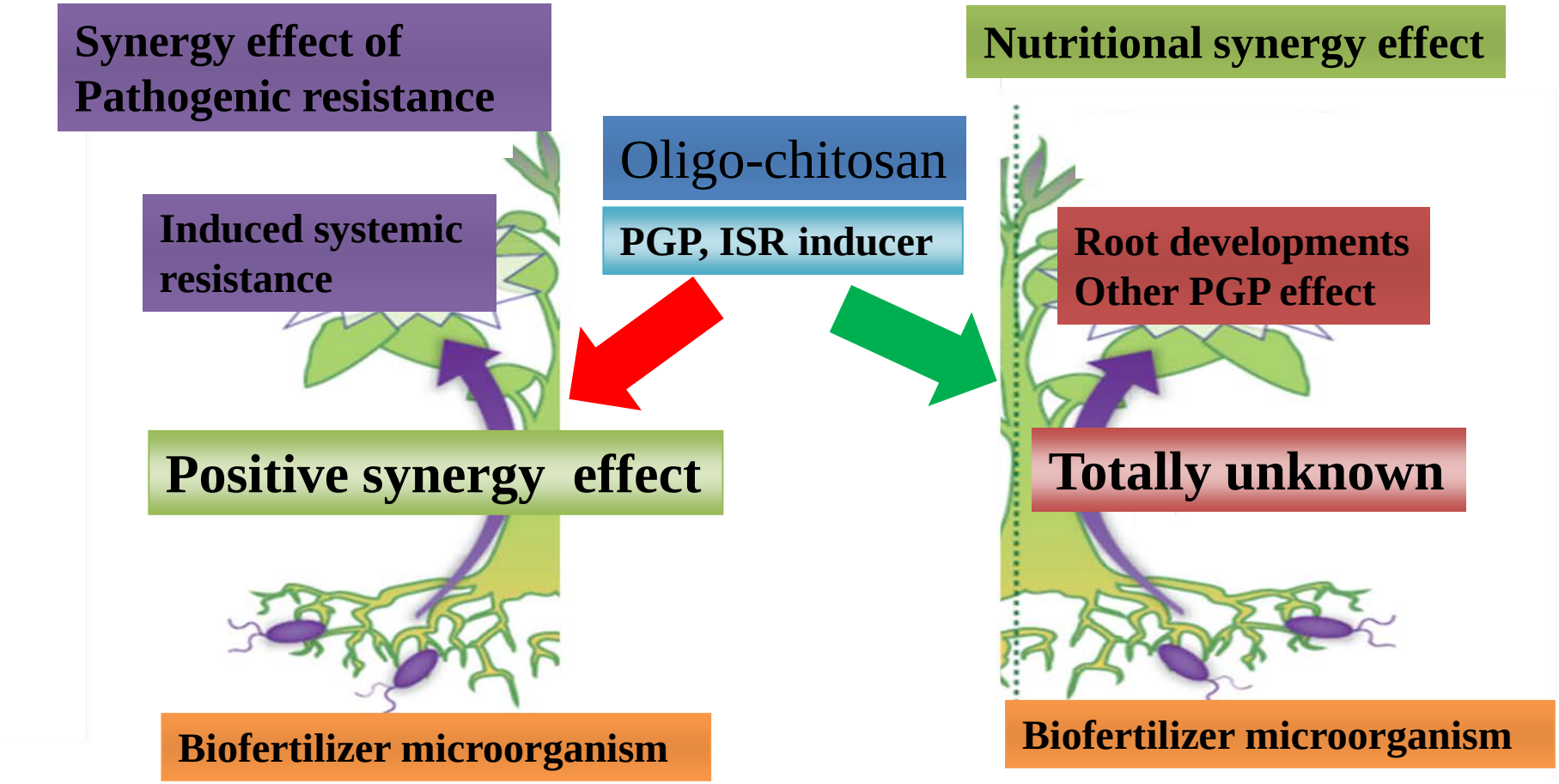


The low molecular weight chitosan, has the effect of promoting the growth of plants such as rice, barley and soybean.



Oligo-chitosan may induce this ISR response.

Figure 4 Schematic representation of systemically induced immune responses. Systemic acquired resistance (SAR) is typically activated in healthy systemic tissues of locally infected plants. Upon pathogen infection, a mobile signal travels through the vascular system to activate defense responses in distal tissues. Salicylic acid (SA) is an essential signal molecule for the onset of SAR, as it is required for the activation of a large set of genes that encode pathogenesis-related proteins (PRs) with antimicrobial properties. Induced systemic resistance (ISR) is typically activated upon colonization of plant roots by beneficial microorganisms. Like SAR, a long-distance signal travels through the vascular system to activate systemic immunity in above-ground plant parts. ISR is commonly regulated by jasmonic acid (JA)- and ethylene (ET)-dependent signaling pathways and is typically not associated with the direct activation of *PR* genes. Instead, ISR-expressing plants are primed for accelerated JA- and ET-dependent gene expression, which becomes evident only after pathogen attack. Both SAR and ISR are effective against a broad spectrum of virulent plant pathogens.



Concerning pathogenic resistance effect using oligo-chitosan, several past work exists, therefore we expected to find those effects between biofertilizer and oligo-chitosan.

However, concerning nutritional synergy effect between biofertilizer and oligo-chitosan, this is the first challenge in the world. Therefore, nutritional synergy effect between biofertilizer and oligo-chitosan is totally unknown.

Concerning nutritional synergy effect between biofertilizer and oligo-chitosan, we need more basic experiment together with field tests.

At first, under conventional fertilizer condition, we need to confirm PGP effect of oligo-chitisan to several target crops, ourselves.

Basic treatment
- Conventional fertilization
- Conventional fertilization + oligo-chitosan

Second treatment
- Conventional fertilization
- Conventional fertilization + oligo-chitosan
- Conventional fertilization + biofertilizer
- Conventional fertilization + biofertilizer + oligo-chitosan

Strengthen of synergy effect may be affected by crop species, application amount of oligo-chitosann, timing of application of oligo-chitosan and biofertilizer.
These further combination tests are next step after completion of the basic and second experements.

Application of Rhizobium biofertilizer with Plant Growth Promoter of Oligo-chitosan

Oligo-chitosan has positive effects on developing root nodule number in soybean pot experiments (shown in Fig.1).

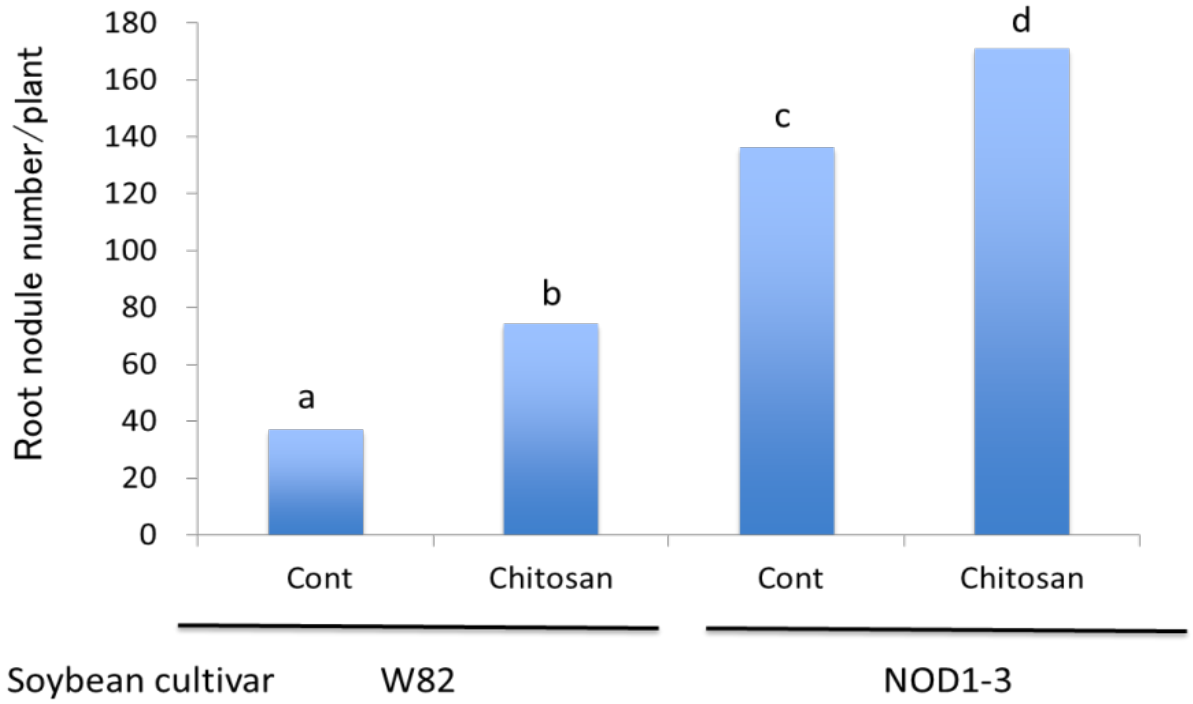


Fig.1 Effect of Oligo-Chitosan on root nodulation of soybean