CURRENT STATUS OF DISSEMINATION OF ASD IN JAPAN AND FUTURE DIRECTIONS

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Anaerobic soil disinfestation (ASD) is a promising soilborne disease control measure. ASD consists of the addition of a labile carbon source, irrigation, and covering soil surface with plastic film. Every step aims to facilitate oxygen reduction and soil redox potential (Eh) decline. Several organic materials are used alone or in combination in ASD. Ethanol-based commercial material 'Ecologi-al®' has been used most widely in Japan. ASD using ethanol or molasses is very effective also in deep layer in comparison with ASD using solid materials. However, handling of liquid or high viscous material is troublesome. Recently, sugars-releasing organic materials (e.g. molasses-containing livestock feeds) were gathers attentions. They are easily applicable like solid materials and release water soluble components with irrigation.

Ethanol-ASD is used in more than 30 out of 47 prefectures in Japan. The Japan Alcohol Corporation (J. alco), dealing with the Ecologi-al, provides consulting service. Corporately with the company, our research group is having seminar for farmers' associations and fertilizer merchants and are working for optimization of procedure and method of ASD in each area and production systems through soil diagnosis before and after ASD treatment.

It is hard to say dissemination of research results is efficient because missionary work is underestimated in Japan. However we keenly work for ASD and largely contribute to the spread of the Ethanol-ASD. Good stuff not always spreads, widely adapted stuff is the good stuff. Through our activities, it was revealed that there was inappropriate disease diagnosis, usage of infested transplants, or contamination of untreated soil when ASD did not work well. And disadvantages in Ethanol-ASD were also elucidated. Appropriate consulting is essential for improving the technique.

There are several disadvantages with ASD. In some cases with ethanol-ASD, root galling caused by root-knot nematodes was observed in shallow layer but not in deep layer. This was occurred mainly in sandy soil. Almost farmers said such problem seldom occurred when rice bran used. Ethanol-

ASD seemed to be less effective in high drainage soil such as sandy soil. Ammonium might be generated in soil treated with ASD using rice bran and this might effectively suppressed root-knot nematodes.

In Japan, several soilless potting mixes such as rock wool and coco peat are widely used for strawberry and tomato production. If disease occurred, the potting mix should be replaced but because of disposal cost, purchase cost and labor, farmers want to reuse the potting mix. In such case, ethanol-ASD might be a potential method for disinfestation. However, ethanol-ASD tends to be less effective in the cultivation bed system where there is incline or water leak, because it is hard to maintain water level sufficient.

Thus, the effects of ASD using wheat bran and ethanol in shallow layer were compared. Effects of ASD on Fusarium wilt pathogen which was buried and put on soil surface were evaluated. In the result, pathogen buried was equally suppressed independently of organic materials used. But pathogen which was put on surface was effectively suppressed only in wheat bran used treatment.

ASD becomes unstable under low temperature. This is the most important disadvantage. Because of this, usage of ASD is limited by cropping type, climate, and season. However, we discovered that Fusarium wilt pathogen was effectively suppressed by ethanol-ASD operated at 15°C if the soil obtained from an experimental field of IHPB was used. The mechanism of the suppression was not clarified.

As a different approach, effect of Fe^{2+} releasing material was evaluated. Under reduced condition, large amount of Fe^{2+} was observed in soil solution. There are several reports suggested correlation Fe^{2+} to pathogen suppression. Suppression by Fe^{2+} is not affected by temperature. Thus, effects of addition of $FeSO_4$ and Fe^{2+} containing nutrient solution amendments were evaluated under 15°C. In the preliminary test, large amount of $FeSO_4$ soil amendment was need for pathogen suppression but was not ideal. When an organic waste from brewing industry was combined with them, their suppressive effect were much improved.

ASD is undoubtedly useful technique but there are several disadvantages to be overcome. Optimization of procedure and method must be done. On the other hand, clarification of more detailed mechanism might facilitate development of a new technique working without microbial process (soil temperature independent). And improvement of consulting system is also required.

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