土壌改良資材のナノ加工による施用効果の向上

Assessing nanoparticulate lime and phosphate rock and increasing their efficiency as a liming agent and phosphorus source, respectively

本技術は安価で入手可能なリン鉱石や石灰をナノ加工することにより、酸度矯正機能やリン酸肥料としての施肥効率改善・向上を目指したものである。石灰をナノ加工することにより、土壌の下方（10～20cm）へ速やか（40日）に移動し、少量（40～80kgha^{-1}）で土壌酸度を矯正し、アルミニウム毒性を緩和することができる。リン鉱石をナノ加工し酸性土壌にヘクタールあたり1,000kg施用することによって、土壌酸度が矯正されるとともに、植物体にリンが吸収され、植物の生育が良くなる。

Nanoparticulate lime (NL) or phosphate rock (NPR) can be an alternative fertilizer material by improving its efficiency. Applying NL to the top 5 cm at 40 and 80 kg ha^{-1} is effective at increasing the downward movement of Ca and the neutralization of soil acidity to 20 cm depth, as well as rectifying Al toxicity to below critical limit to 10 cm depth.

The soil and plant parameters increased to the same degree at 1,000 and 2,000 kg NPR. Therefore, the use of 1,000 kg ha^{-1} is most economically justified. Regular application of NPR and further research for economic comparison between NPR and both of lime and superphosphate will be needed.

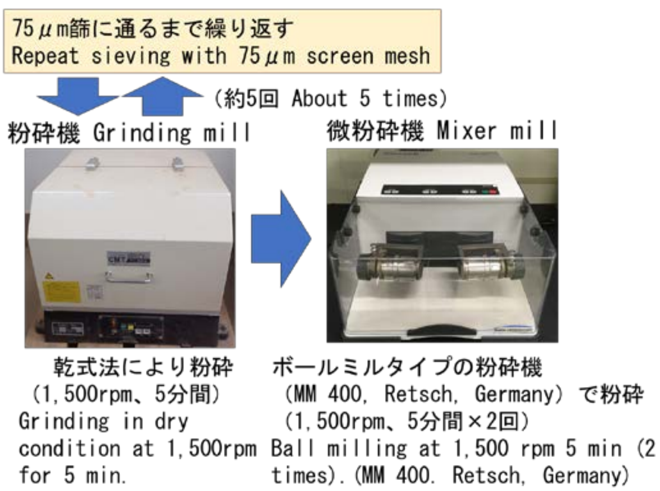

図1　ナノ加工の工程 Fig. 1. Nanoparticulation process

Note: Burkina Faso phosphate rock was used for the experiment.

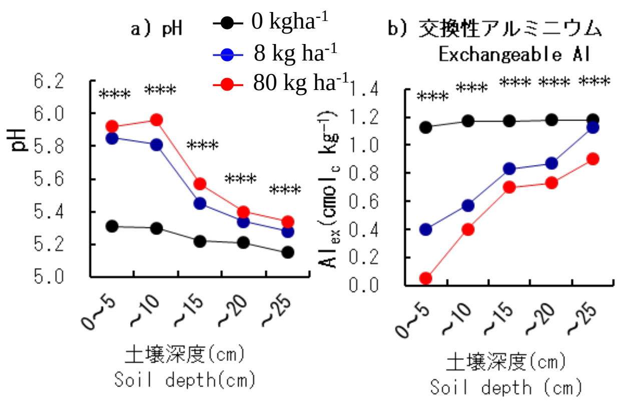

図2　ナノ加工石灰の移動に伴う土壌化学成分の変化

Fig. 2. pH and exchangeable Al of the simulated plough layer with a different nanoparticulate lime (NL)

Note: NL leached with 28cm of water over 40 days.
*** shows significant difference at $p < 0.001$.

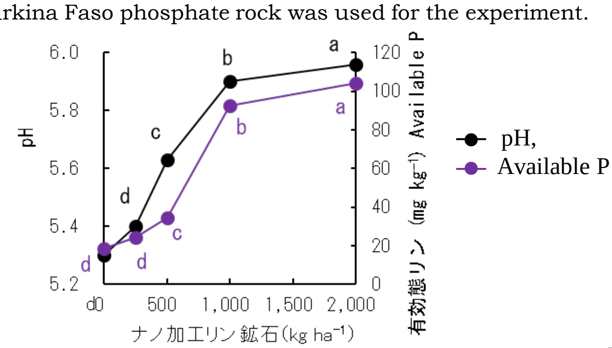

図3　ナノ加工リン鉱石施用による土壌化学成分の変化

Fig. 3. Effects of nanoparticulate phosphate rock on soil pH and available P

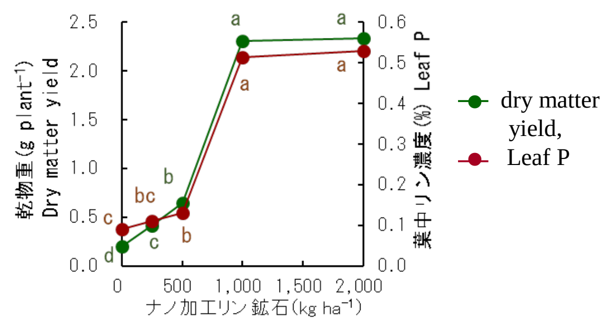

図4　ナノ加工リン鉱石施用がホウレンソウの生育に及ぼす影響

Fig. 4. Effects of nanoparticulate phosphate rock on spinach dry matter yield and leaf P concentration

Note: Data were collected at the end of the growth period (49 days) after pre-incubation (21 days).
Different letters show significant difference (Tukey's HSD).

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