A New Iron Fertilizer for Promotive Plant Growth

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Abstract

A mass production technology for FeO and technology to retard oxidation of the developed FeO in water and atmospheric environments were successfully developed based on Aichi Steel's special steel technology. In comparison with conventional FeO, which has the property of easily dissolving in water, the new FeO material developed by Aichi Steel (hereinafter referred to as developed FeO) resists oxidation in water for more than 1 year. Aichi Steel also successfully developed a technology for dissolving Fe^{2+} out of the developed FeO. The developed FeO consists of FeO as its main component, and also contains minerals such as Ca, Mg, Zn, etc. Based on these technologies, a new iron fertilizer using the developed FeO as its matrix was prepared and supplied to various plants. As a result, organ growth and increased contents of minerals, vitamins, polyphenols, and sugar were observed in many of the plants.

Fig.1. Features of developed FeO

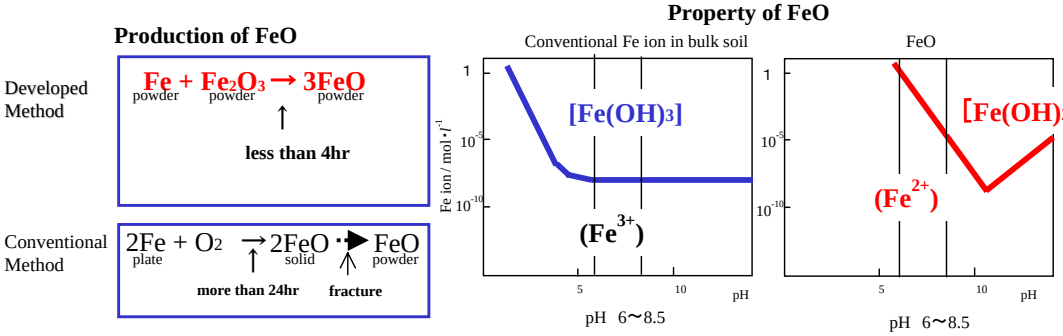


Fig.2. FeO that is not easily rusted
(Fe(II) ions dissolved in water are not transformed into Fe(III) ions)

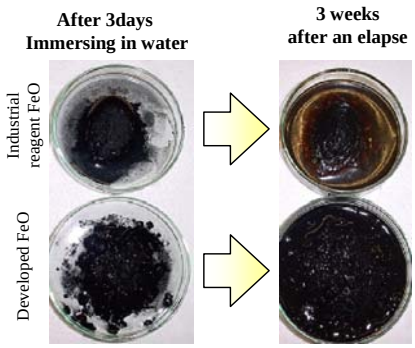
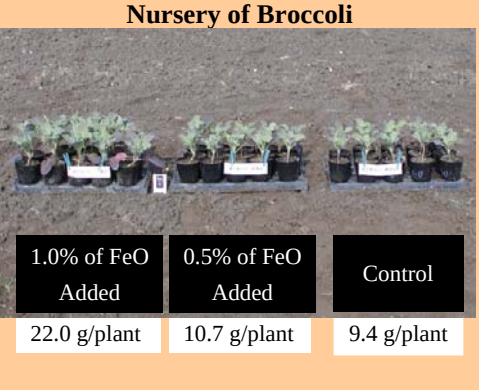
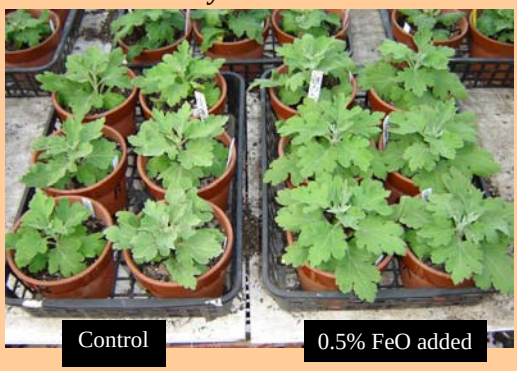


Fig.4. Examples of promoting plant growth by FeO

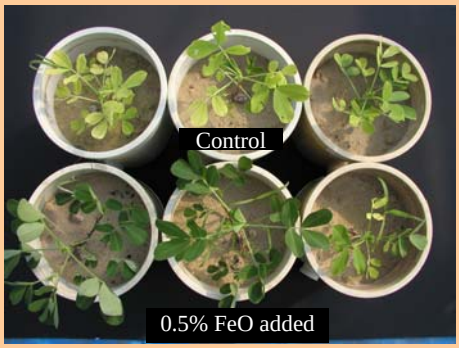
Nursery of Broccoli



Chrysanthemum



Peanut in calcareous soil



Upland Rice in calcareous soil

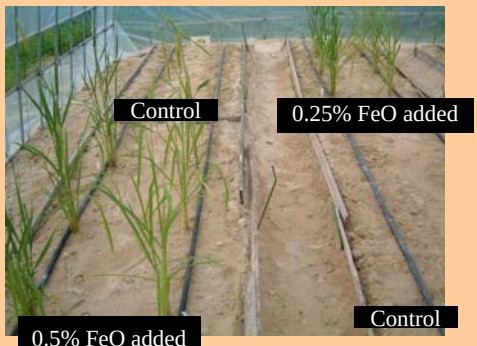


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Fig.3. Rust inhibition mechanism for FeO that is not easily rusted

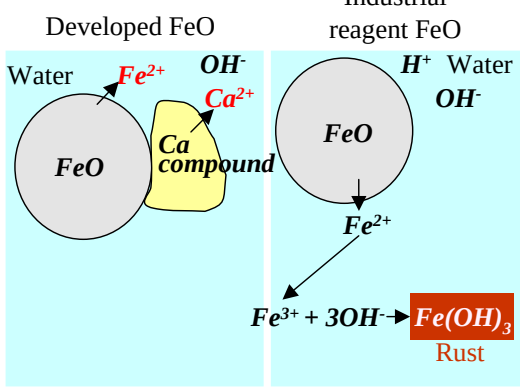
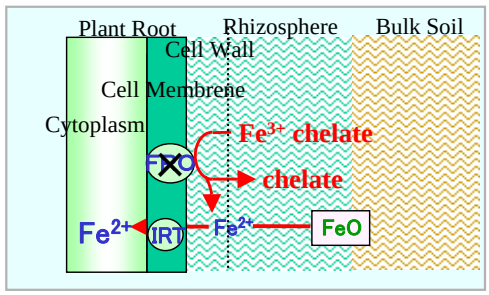


Fig.5. Fe acquisition mechanism in plants



Fe reagent with extremely large potential for solution of global environmental problems -Future perspectives-

Using graphs showing the relationship between the atmospheric CO_2 concentration and amount of Fe descent through the atmosphere over the past 160,000 years based on ice column samples taken at the Vostok Station (Lake Vostok, Antarctica), J.H.Martin et al. published a hypothesis that atmospheric CO_2 was reduced by CO_2 absorption associated with phytoplankton proliferation when Fe was supplied to seawater as a micronutrient.[5)] To verify this theory, scientists added Fe in sulfate form to a marine area, which high-nitrate and low-chlorophyll and confirmed phytoplankton proliferation.[4)5)] This indicates that Fe ions can prevent an increase in CO_2 levels by encouraging phytoplankton proliferation. However, there is a major problem with those field experiments, namely, the solubility (sustainability) of Fe^{2+} ions in seawater. The larger part of the supplied Fe^{2+} ions immediately precipitate and settle out, without being used by the phytoplankton. Our developed FeO makes it possible to sustain Fe^{2+} in seawater over an extended period, and therefore has the potential to become a CO_2 absorption reagent (phytoplankton proliferation accelerator) in oceans. In other words, our developed material has high potential for creating a healthier planet.

In calcareous soils, effective Fe-fertilizers for basal use are not yet well developed. Our material can keep sustainable Fe^{2+} concentration in the rhizosphere under alkaline conditions. Therefore, every Strategy-I plants which has *IRT1* gene (Fe^{2+}-transporter) for Fe acquisition mechanism can grow even in calcareous soils by absorbing Fe^{2+} from our material. Thus our material can be contributable to crop production as well as greening deserts in all over the world if water is not short of supply.

References

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