In the four decades which have elapsed since Berthelot first recognized the fact that gains in nitrogen occurred in bare, unsterilized soil and concluded that these gains were due to the action of chlorophyllless micro-organisms, numerous investigations of the so-called non-symbiotic nitrogen-fixing organisms have been carried out.

A vast amount of information regarding these organisms and their action in soil has been accumulated, but it must be admitted that there are still many questions which remain unanswered, many occurrences unexplained, and many observations unconfirmed.

Thorough knowledge of the factors which control non-symbiotic nitrogen fixation or azofication (a term objected to in some quarters) is essential before definite conclusions regarding the inoculation of soils with Azotobacter can be reached. Slowly but surely experimental evidence is piling up and a final solution of the many problems connected with the process may confidently be expected.

At present, the inoculation of soil with Azotobacter must be considered in the experimental stage. It is not yet practical, but there are indications which point to a future practical utilization of this method of increasing and maintaining the nitrogen content in soils. The importance of such a practice to soil fertility and permanent agriculture is evident, and it may find a large place in future systems of soil management.

It is purposed in this paper to summarize briefly the information at present available regarding soil inoculation with non-symbiotic nitrogen-fixers, to present some data recently secured at the Iowa experiment station, and to call attention to the great desirability of further work along this line.

HISTORICAL

The first attempt to inoculate soils with nitrogen-fixing bacteria was made by Caron (3). He found that cultures of certain organisms, inoculated into soil, generally brought about greater crop yields. The best results were secured with a spore-bearing bacillus, later called B. Ellenbachensis. A commercial firm put on the market a bacterial culture of the supposed nitrogen-fixing organism, calling the preparation Alinit.

1Paper read as a part of the symposium on "Nitrogen Fixation" at the meeting of the Society held in Washington, D. C., November 11, 1924.

2Professor of soils and student assistant, respectively, Iowa State College, Ames, Iowa.

3Reference by number is to Literature Cited, p. 473.