## VITALITY AND GROWTH OF SEEDS BURIED IN SOIL.

## W. J. BEAL.

IN the autumn of 1879, nearly ten years ago, I buried in bottles seeds of twenty-one kinds of plants. The seeds were mixed in sand taken from three feet below the surface of the soil. The seeds were mixed in the soil which loosely filled the bottle, and buried about twenty inches below the surface.

About two months ago, these seeds and the soil were removed to the botanical laboratory and kept moist most of the time.

Owing to an oversight at one time, I am unable to give the exact number of seeds of some of the sorts which germinated, still there seems to be enough to warrant a brief statement of the results. Some seeds of the following ten species, and probably few others, made a good start in germination:

Amaranthus retroplexus, L. Pigweed. Brassica nigra Kerh. Black Mustard. Capsella Bursa-pastoris Manch. Shepherd's Purse. Lepidium Virginicum, L. Pepper-grass. Anthemis Cotula, L. Mayweed. Enothera biennis, L. Evening Primrose. Polygonum Hydropiper, L. Smartweed. Portulaca oleracea, L. Purslane. Setaria glauca, Beano. Pigeon-grass. Fox-tail. Stellaria media. Smith. Chick-weed.

Some experiments made in burying acorns and black walnuts at different depths in the soil, induce me to believe that some of the seeds which did not retain their vitality, might have done so, had the sand been well packed and had the seeds been planted deeper than twenty inches.

## ACORNS BURIED DEEPLY IN SAND.

In an experiment begun ten years ago, where black-oak acorns had been buried in sand in sod ground about fifteen inches below the surface, every one was found decayed at the expiration of two years.

Four years ago, lacking two months, I buried in well drained sand, some black walnuts and black-oak acorns. They had been recently gathered and were supposed to be in good condition. They were buried all the way from very near the surface to a depth of three feet. After they had remained nearly two years, some of them were examined with the following results: Some of the walnuts and acorns planted only a few inches beneath the surface, had come up the next summer after planting, while those planted from about eight inches to two feet or a little over, below the surface, had all decayed.

All the walnuts deeply planted had decayed, but some of the acorns planted from two to three feet below the surface were still alive—or rather, the young plants were alive. They had probably started soon after planting, as the cotyledons were exhausted, their nourishment having been used in developing roots and pushing up an ascending axis. On the 12th of this month (August, 1889), after a part of the nuts had been planted and undisturbed for two months less than four years, I examined them.

Eight acorns were found alive, with the roots about like the roots of those dug up two years ago. The ascending axis in most cases was slender and crooked, with a delicate white apex. In one case there was no ascending axis, but a solid fleshy root, apparently alive.

Some of the buried acorns are supposed to have been inhabited by the larvæ of insects. When digging the acorns which had been buried two years ago, near them were found six larvæ, which my colleague, Prof. A. I. Cook, pronounced the young of a beetle living in acorns

Prof. A. J. Cook, pronounced the young of a beetle living in acorns On recently digging the acorns buried for nearly four years, two white pupæ were found near the acorns, apparently alive, but still waiting for the day of resurrection which suddenly came to them the twelfth of August, 1889.

These were taken to the laboratory and the sand containing them covered with a plate. On August 21st, after nine days, the insects were taken from the sand in a mature condition, though not very active. They are both beetles, but belong to different genera.



The figures illustrate, two-thirds natural size, the appearance of some of the young oaks as they appeared when taken from the ground, except that the lower end of the roots in several cases is not represented in the drawings.