

the name of *Saxifraga Montezumae*. A. G.
D 8. *Does Sea-water kill Seeds?*—A question which has an important bearing upon the actual or possible dispersion of many species over the large geographical area which they are found to occupy, and therefore upon the problem whether the same organic being was created at one point, or at several or many widely separated points, on the face of the globe. It is commonly believed and stated that seeds—those of maritime plants excepted—will not germinate after exposure to salt water: and so general is the belief, that no one, so far as we know, has made the experiment until now, when the distinguished naturalist, Mr. Darwin, has shown that seeds of various kinds will germinate promptly after prolonged immersion in sea water. The account of his simple but well-devised experiments is given in the *London Gardeners' Chronicle* for May 26th, 1855. We copy the principal part of it.

“As I had not the least notion when I began, whether or not the seeds would be all killed by a single week's immersion, I at first took only a few, selecting them almost by chance from the different great natural families; but I am now trying a set chosen on philosophical principles, by the kindness of Dr. Hooker.

“The sea-water has been made artificially with salt procured from Mr. Bolton, 146, Holborn Bars, which has been tested by better chemists than men, namely, by numerous sea animals and algæ having lived in it for more than a year. The seeds were placed in separate bottles, holding from two to four ounces each, out of doors in the shade: the mean temperature has during the period been about 44° , rising during one week to a mean of nearly 48° . Most of the seeds swelled in the water, and some of them slightly colored it, and each kind gave to it its own peculiar and strong odor. The water in which the Cabbage and Radish seeds were placed became putrid, and smelt offensively in a quite extraordinary degree; and it is surprising that any seeds, as was the case with the Radish, could have resisted so contaminating an influence; as the water became putrid before I had thought of this contingency, it was not, and has never been, renewed. I also placed seeds in a quart bottle in a tank filled with snow and water, to ascertain whether the seeds kept at the temperature of 32° would better resist the salt water; this water, like that in the small bottles, to my surprise, became turbid and smelt rather offensively. In the following list I have no reason to suppose, except in the cases where so stated, that the seeds have endured their full time.

“(1) Seeds of common Cress (*Lepidium sativum*) have germinated well after 42 days' immersion; they give out a surprising quantity of slime so as to cohere in a mass. (2) Radishes have germinated less well after the same period. (3) Cabbage seed: after 14 days' immersion only one seed out of many came up; I think this is rather strange considering that the cabbage is a sea-side plant; in the ice-cold salt water, however, several have come up after 30 days' immersion. (4) Lettuce seed has grown well after 42 days; (5) of Onion seed only a

few have germinated after the same period; (6) Carrot and (7) Celery seed well after the 42 days; (8) *Borago officinalis*, (9) *Capsicum*, (10) *Cucurbita ovifera*, have germinated well after 28 days' immersion; the two latter, rather tender kinds, were also tried in the ice-cold water, and have germinated after 30 days' immersion. (11) Savory, or *Satureja*, has grown somewhat less well after 28 days. (12) *Linum usitatissimum*: only one seed out of a mass of seeds (which gave out much slime) came up after the 28 days, and the same thing happened after 14 days; and only three seeds came up after the first seven days' immersion, yet the seed was very good. (13) Rhubarb, (14) Beet, (15) Orach, or *Atriplex*, (16) Oats, (17) Barley, (18) *Phalaris Canariensis*, have all germinated excellently after 28 days; likewise these six latter after 30 days in the ice-cold water. (19) Beans, and (20) Furze or *Ulex*: of these a few survived with difficulty 14 days; the Beans were all killed by 30 days in the ice-cold water. (21) Peas germinated after seven days, but were all dead after 14 days' immersion out of doors, and likewise after 30 days in the ice-cold water. (22) *Trifolium incarnatum* is the only plant of which every seed has been killed by seven day's immersion; nor did it withstand 30 days in the ice-cold salt water. (23) Kidney Beans have been tried only in the latter water, and all were dead after the 30 days.

“As out of these 23 kinds of seed, selected almost at hap-hazard, the five Leguminosæ alone have as yet been killed (with the exception of the Cabbage seed, and these have survived in the ice-cold water), one is tempted to infer that the seeds of this family must generally withstand salt water much worse than the seeds of the other great natural families; yet, from remarks in botanical works, I had expected that these would have survived longest. It has been really curious to observe how uniform, even to a day, the germination has been in almost every kind of seed, when taken week after week out of the salt water, and likewise when compared with the same seeds not salted—all of course having been grown under the same circumstances, namely, in glasses on my chimney-piece, so that the seeds from the day of being planted have been always under my eye. The germination of the Rhubarb and Celery alone has been in a marked degree altered, having been accelerated. With respect to *Convolvulus tricolor*, not included in the above list, I may mention that many of the seeds germinated and came out of their husks, while still in the salt water, after six or seven days' immersion.

“To return to the subject of transportal, I may state that in 'Johnston's Physical Atlas' the rates of 10 distinct currents in the Atlantic (excluding drift currents) are given, and the average of them is 33 nautical miles per diem; hence in 42 days, which length of immersion seven out of the eight kinds of seed as yet tested have already stood, a seed might be readily carried between 1300 and 1400 miles.

“I will conclude this too lengthy communication by observing that all the 40 to 50 seeds which I have as yet tried sink in sea-water: this seems at first a fatal obstacle to the dissemination of plants by sea currents; but it may be doubted whether most seeds (with the exception of the winged kinds), when once shed, are so likely to get washed into the sea as are whole or nearly whole plants with their fruit, by

being carried down rivers during floods, by water-spouts, whirlwinds, slips of river-cliffs, &c., continued during the long lapse of geologically modern ages. It should be borne in mind how beautifully pods, capsules, &c., and even the fully expanded heads of the Compositæ, close when wetted, as if for the very purpose of carrying the seed safe to land. When landed high up by the tides and waves, and perhaps driven a little inland by the first inshore gale, the pods, &c., will dry, and opening will shed their seed; and these will then be ready for all the many means of disposal by which Nature sows her broad fields, and which have excited the admiration of every observer. But when the seed is sown in its new home, then, as I believe, comes the ordeal; will the old occupants in the great struggle for life allow the new and solitary immigrant room and sustenance?"

It would be well to submit to this experiment the seeds of a considerable number of those very species which naturally occur in two or more widely separated areas. And also to take the seeds of indigenous individuals, rather than of those of long-cultivated plants, which last certainly possess augmented vegetative power, though perhaps they may not offer increased resistance to the action of salt water.

We have just learned from Mr. Darwin that some of these seeds have germinated after 82 and 85 days' immersion in sea-water, namely, those of Radishes, Beet, Atriplex, Capsicum, Oats, Cucurbita, Rhubarb, Lettuce, Carrot, Celery, and Onions.