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# EFFECT OF MONTMORILLONITE BASED HYDROGELS APPLICATION ON MORPHOLOGICAL CHARACTERISTICS OF LETTUCE SEEDLINGS (*LACTUCA SATIVA*)

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**Keywords**: *hydrogels, lettuce, montmorillonite, morphological parameters*.

## INTRODUCTION

The agricultural sector and food production have witnessed persistent expansion in the past few decades. This occurrence has resulted in the excessive utilization of intensive production methodologies, leading to the unsustainable depletion of soil nutrients and water resources. Numerous research endeavors have been undertaken with the aim of examining the influence of hydrogels on the enhancement and optimization of agricultural inputs. The aim of this study is to assess the impact of four different compositions of hydrogels based on montmorillonite on the morphological characteristics of lettuce seedlings (*Lactuca sativa*) subsequent to the transplanting procedure, in the greenhouse conditions.

## MATERIALS AND METHODS

The polymeric materials used in this study were received from The National Institute for Laser, Plasma and Radiation Physics, Măgurele. They were obtained utilizing the electron beam radiation technique and, in their composition, potassium persulfate was added as a catalyst. Four distinct compositions of hydrogels, based on montmorillonite were used in this study. Further, two methodologies for the application of the hydrogels were investigated, specifically the granular form (Hg) and beads (Hb) (Table 1). The lettuce (*Lactuca sativa*) seedlings placed in alveolar tray, were acquired from VDRS Buzău.

**Table 1. Sample codification used in this study**

| Sample code | | Montmorillonite dose (%) |
|---|---|---|
| Bead Hydrogel | Granular Hydrogel | |
| Hb1 | Hg1 | 0 |
| Hb2 | Hg2 | 0.25 |
| Hb3 | Hg3 | 0.5 |
| Hb4 | Hg4 | 1 |
| C | | Control sample with no hydrogel |

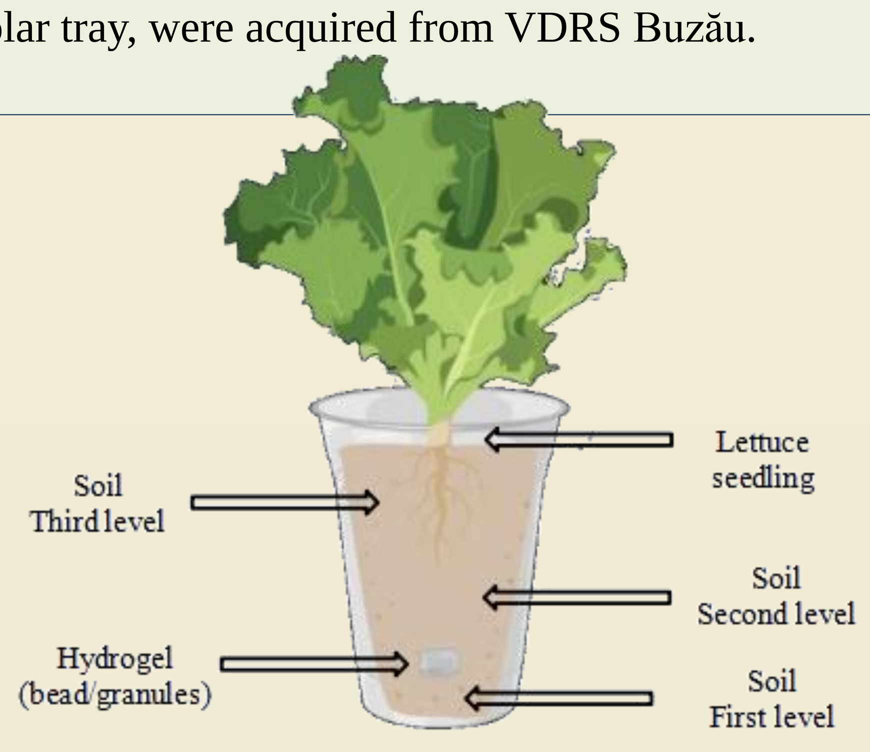

**Fig. 1 Working protocol**

For this experiment, cups were used, in which soil (first level) and the hydrogel samples as beads and granules, weighing approximately 0.2g were placed. Second level of soil was then added and hydration was carried with 100 ml water/each sample to assure the maximum swelling degree of the hydrogels. Further, after 24h, lettuce seedlings were transplanted and the third level of soil was then added (Figure 1). After 3 weeks, the seedlings were transplanted from cups into pots.

The overall height of the samples was determined weekly measuring from the ground level to the greatest height of the highest leaf of each sample. The number of leaves of the samples was determined weekly by counting every leaf after the removal of the dry ones. Relative content of chlorophyll of the samples was determined after transplanting the samples to pots and after an accommodation period of 14 days using the BIOBASE Portable Chlorophyll Meter CM-B.

## RESULTS AND DISCUSSIONS

**The height parameter** after 35 days for lettuce with hydrogel: Hb2<Hb4<Hb1<C<**Hb3 (Fig. 2)** and Hg4<Hg1<Hg3<Hg2<C (Fig. 3).
**The number of leaves** after 35 days for lettuce with hydrogel: C<**Hb1<Hb3<Hb4<Hb2 (Fig. 4)** and C<**Hg1<Hg3<Hg2<Hg4 (Fig. 5)**
**The relative content of chlorophyll** after 35 days for lettuce with hydrogel: Hb1<Hb3<C<**Hb4<Hb2 and** Hg2<Hg1<C<**Hg3<Hg4 (Fig. 6)**

## CONCLUSIONS

The results of this study showed no noticeable differences regarding the height of lettuce transplanted with hydrogels compared to the control sample with a few exceptions, such as Hb3 (hydrogel with medium concentration of montmorillonite). The remaining samples registered close of slighly lower values than the control.

Meanwhile, the total number of leaves and relative content of chlorophyll proved to be significantly higher for lettuce cultivated with hydrogels (bead and granules) compared to the control sample. The hydrogels with a high (Hg4 and Hb4) and medium (Hg3 and Hb3) concentration of montmorillonite proved to enhance these two parameters for the lettuce plants in both forms of administration (bead and granules). Therefor, the montmorillonite based hydrogels proved to enchance some morphological parameters of lettuce.

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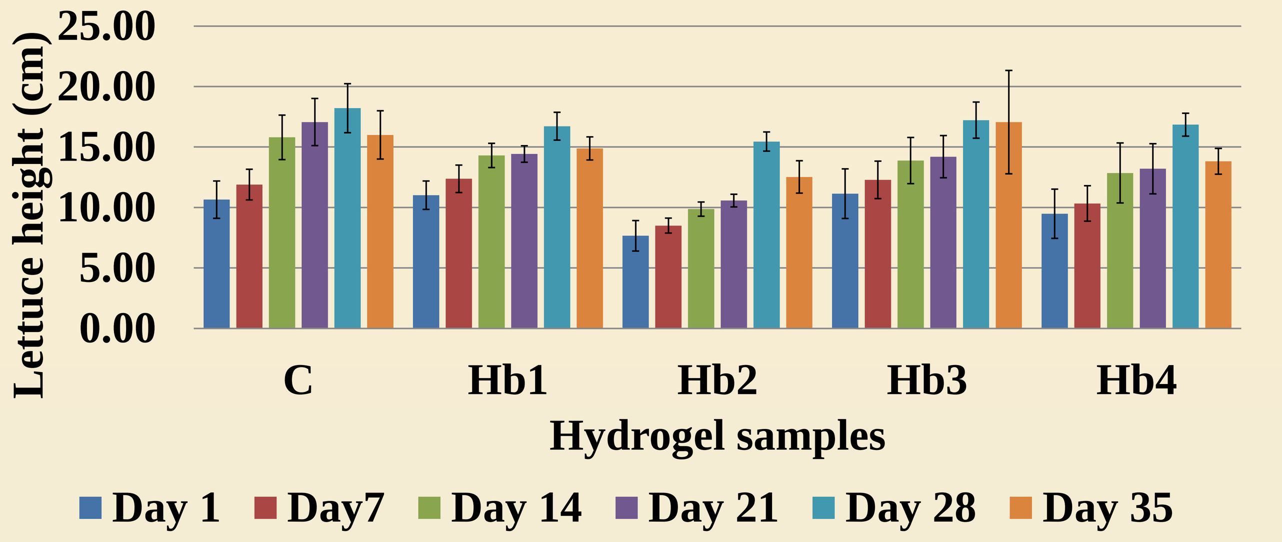

**Fig. 2 Lettuce height cultivated with hydrigel beads**

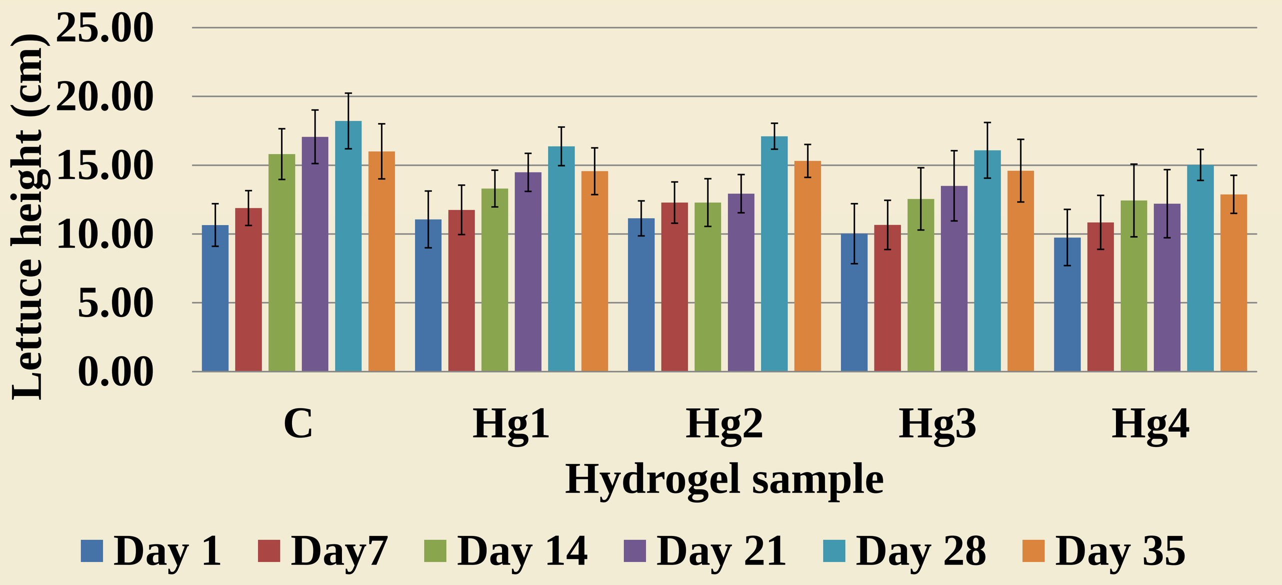

**Fig. 3 Lettuce height cultivated with hydrigel granules**

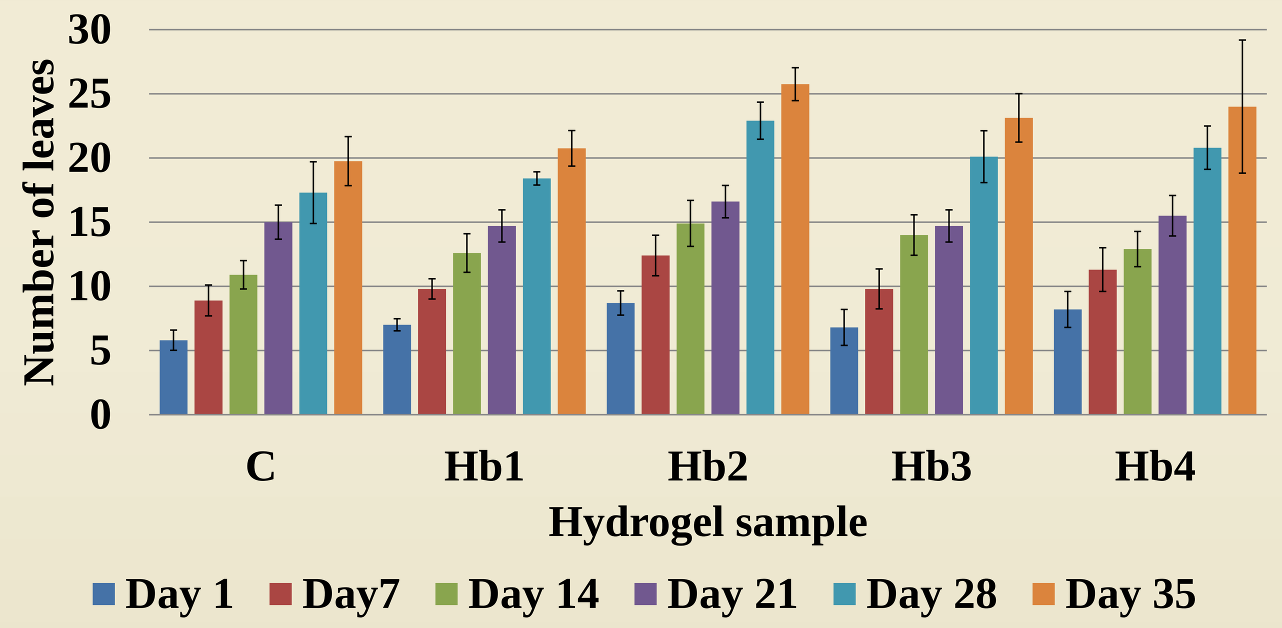

**Fig. 4 Number of leaves of lettuce samples cultivated with hydrogel beads**

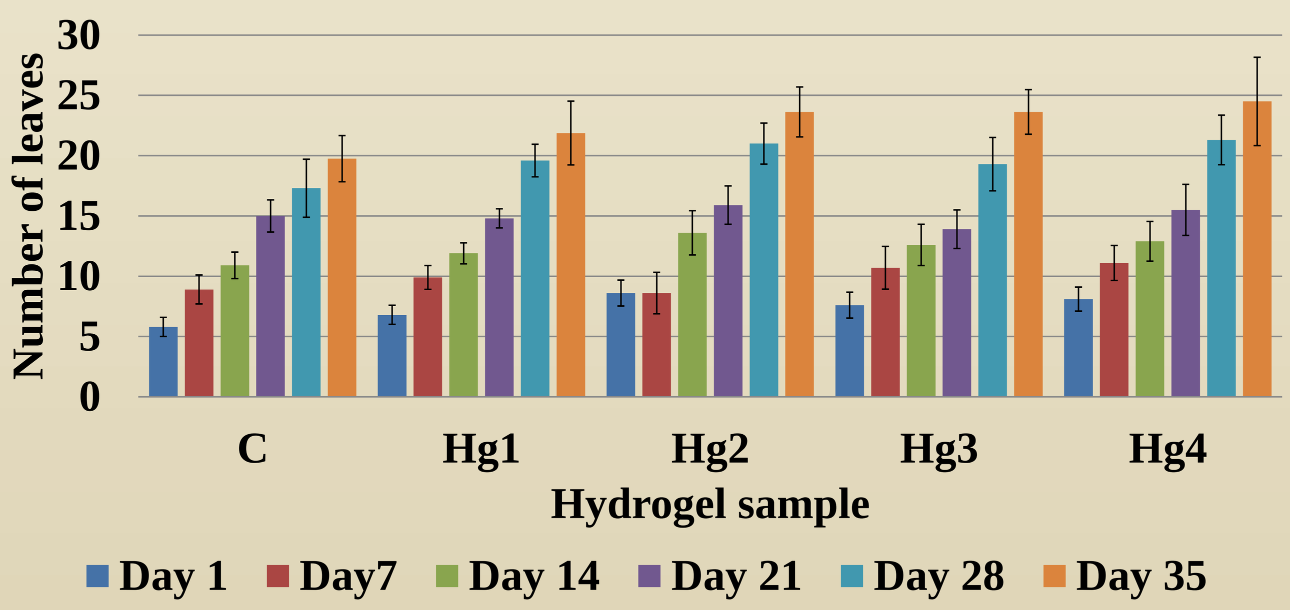

**Fig. 5 Number of leaves of lettuce samples cultivated with hydrogel granules**

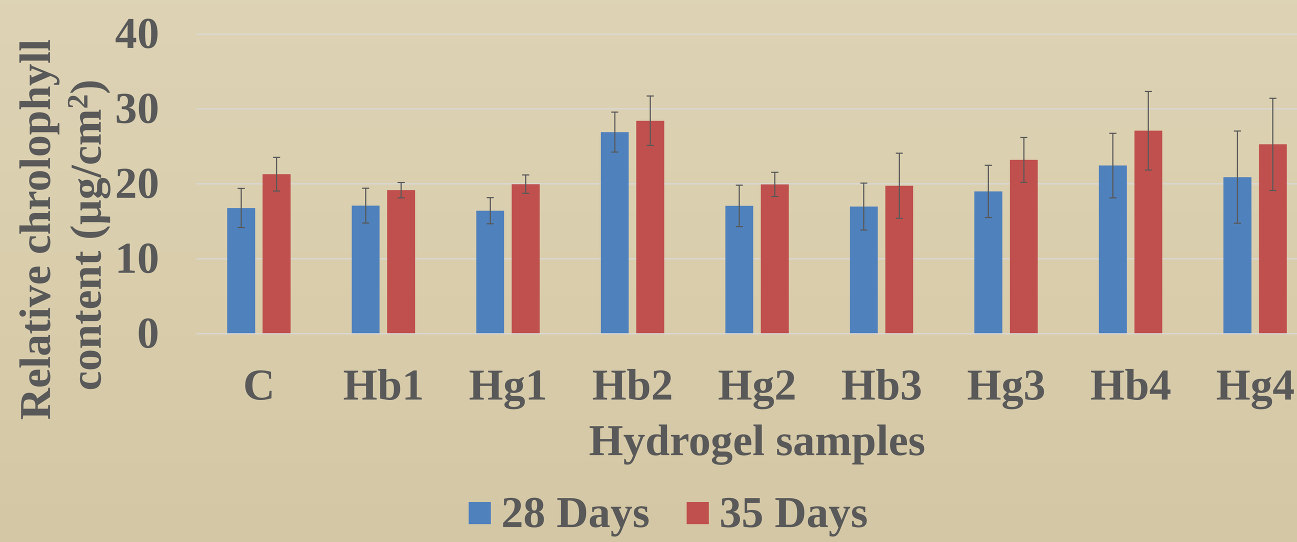

**Fig. 6 Relative chlorophyll content of lettuce samples**