

# Phenotypic evaluation of cucumber lines characterized by dwarf plant architecture



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## INTRODUCTION

Identification of the genes underlying plant growth habit is one of the goals of applied plant genetics. Such genes are important for improving crop yield (Wang and Li, 2006).

In cucumber there are attempts to develop dwarf cultivars that will be useful for mechanical fruit harvest.

The goal of this study was to describe the growth traits of cucumber lines characterized by dwarf phenotype.

## MATERIAL AND METHODS

Two experiments were performed simultaneously in plastic tunnel and open-field conditions at the SGGW Experimental Station Wolica in the year 2021 (Fig. 1).

Ten lines characterized by a different type of growth were investigated and five of them were developed based on chemically-induced mutants described by Kubicki (1983). The tested lines were compared with the standards of a typical cucumber, continuous (unlimited) type of growth - monoecious L500 (B10DH) and female L501 (Gy14). Investigated traits were evaluated four weeks after planting.

In both experiments, features related to plant habit were assessed, such as: main shoot length, number and length of main shoot internodes, number and length of side shoots, as well as leaf characteristics. In addition, the type of plant growth, the intensity of femininity, the color of the leaves and the color of the spines on the fruit were assessed. A total of 11 morphological features were assessed.



Fig 1. Experiment conducted in plastic tunnel (A) and on field (B)

## RESULTS

Significant differences in growth characters were detected within the lines. In relation to the reference lines, the assessed lines were characterized by significantly lower values of the examined features (Fig. 2 and 3).

The L505 line with a rosette-like habit was characterized by the shortest main shoot. The shoots of this line were about ten times shorter than that of the reference lines. This line did not produce side shoots and was described as single-shoot (Fig. 2 and 3).

About 3 times shorter main shoot than the reference lines, and the smallest number and length of internodes were found in three lines: L504, L511 and L512. The next two lines L506 and L507 were characterized by a terminating type of growth and had a similar length of the main shoot, at the same time the shoot was approx. 40-50% shorter compared to the reference lines (Fig. 2).

The three female lines L508, L509 and L510 as compared to the standards, had approx. 20-30% shorter main shoot and did not differ in the number and length of lateral shoots. The total length of all shoots for these lines was about 40% shorter than the L500 reference line (Fig. 2 and 3).

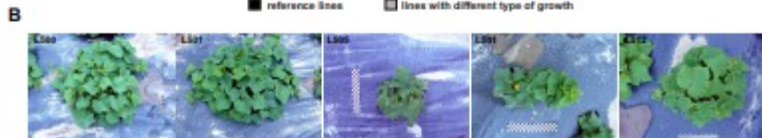
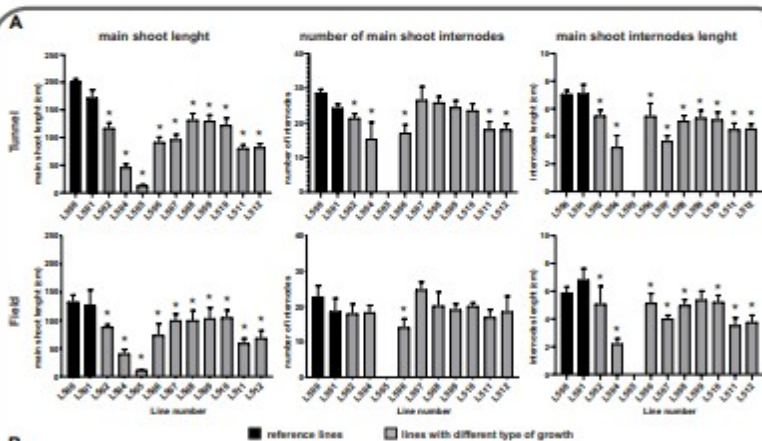


Fig 2. Average values of traits related to plant growth habit in 12 cucumber lines growing in the field and in the plastic tunnel. Reference lines: L500 - B10DH and L501 - Gy14 (A). Examples of lines with a dwarf growth habit, in relation to the references, two weeks after planting (B).

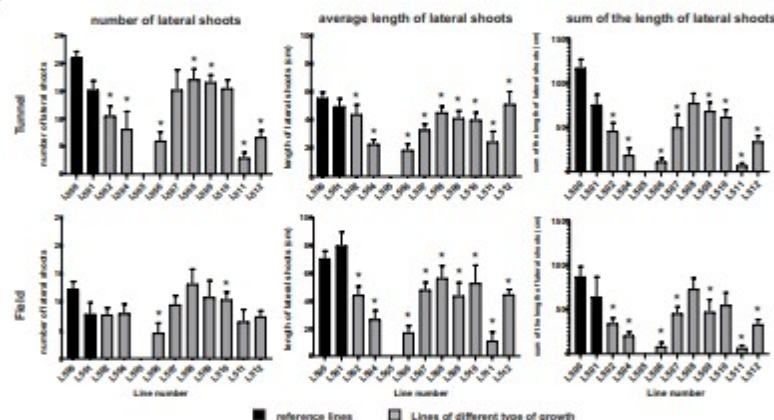


Fig 3. Average values of traits related to plant growth habit in 12 cucumber lines growing in the field and in the plastic tunnel. Reference lines: L500 - B10DH and L501 - Gy14.

## RESULTS

The differences in the leaf and fruit morphology were also detected. The leaves with the largest blades formed lines L506 and L509, while the smallest blades were found in line L508. The color of leaves was differentiated, from light green for the L512 line to very dark green for the L505 and L511 lines (Fig. 3). Lines assessed were monoecious (6 lines and L500 control) or female (4 lines and L501 control). The spines on the fruit of the tested lines were white as in the L501 line or dark as in the L500 line.

Investigated traits were modified by the growth conditions. Lines grown in the plastic tunnel were characterized by higher values of majority of examined traits. This might be related to better growing conditions in a plastic tunnel.

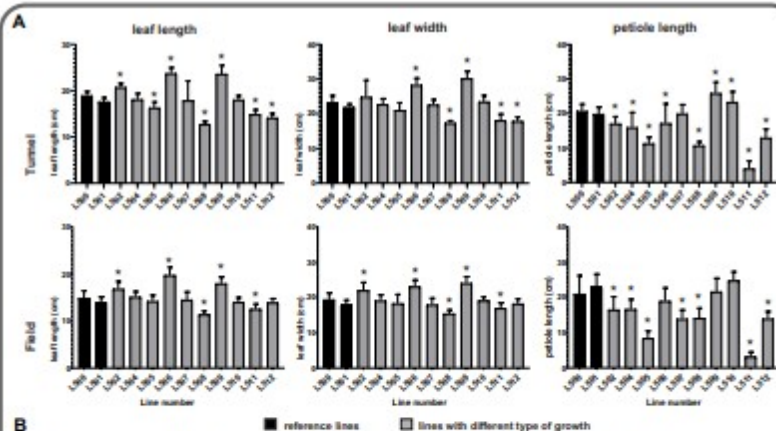


Fig 4. Average values of leaf traits in 12 cucumber lines growing in the field and in the plastic tunnel. Reference lines: L500 - B10DH and L501 - Gy14 (A). Leaf blades of examples of cucumber lines, in relation to the references (B).

## CONCLUSIONS

1. The results indicate a large diversity of the examined cucumber lines, especially in terms of features such as the length of the main shoot as well as the length and number of lateral shoots.
2. Plants growing in the plastic tunnel, compared to those grown in the field, were characterized by a greater length of the main shoot and a greater number and length of lateral shoots.
3. Two of the tested lines (L506 and L507) showed a terminating type of growth, and one line (L505) showed a single-shoot rosette.

The study is currently underway to identify the genes that determine growth type in selected cucumber lines.

## ACKNOWLEDGEMENTS

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