Zeitschrift: Berichte des Geobotanischen Institutes der Eidg. Techn. Hochschule, Stiftung Rübel

Herausgeber: Geobotanisches Institut der Eidg. Techn. Hochschule, Stiftung Rübel

Band: 55 (1989)

Artikel: Studies on competition between closely related species of Scabiosa columbaria L.s.l. Part 2. Differentiation of hybrid populations under different temperature, water and nutrient conditions = Konkurrenzuntersuchungen zwischen nah verwandten Arten von Scabiosa columbaria L.s.l. : Teil II. Differenzierung von Bastardpopulationen unter verschiedenen Temperatur-, Feuchtigkeits- und ...

Autor: Landolt, Elias / Binz, Hans-Rudolf

Kapitel: 3: Summary of the results of part 1

DOI: https://doi.org/10.5169/seals-377754

Nutzungsbedingungen

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. Mehr erfahren

Conditions d'utilisation

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. En savoir plus

Terms of use

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. Find out more

Download PDF: 01.04.2026

ETH-Bibliothek Zürich, E-Periodica, https://www.e-periodica.ch

3. SUMMARY OF THE RESULTS OF PART I

Results on the behaviour of pure species have been published by LANDOLT et al. (1975). A short summary of those investigations follows below.

3.1. General results

- The three species responded in different ways to the various experimental conditions, some aspects being taxonomically important, some others being only of statistical value.
- The number of flower-heads is strongly correlated to the dry weight of the shoot. In all three species the average of 3.5 g shoot dry weight corresponds to one flower-head. The height of the shoot and the root dry weight do not show a similar pattern. The diameter of the rosette varied greatly, both individually and seasonally; consequently, differences between the various treatments could only partially be evaluated.
- Under warm conditions in the greenhouse the dry matter production of three plants per culture container was about the same as that of six plants per container (under the same conditions).
- *Scabiosa columbaria*, *S. gramuntia* and *S. lucida* root down to an the average depth of almost 130 cm within one vegetation period (at low ground water table). The roots of some plants even reached a depth of more than 150 cm.

3.2. Influence of fertilization

- The various fertilizer treatments influenced particularly the number of flower-heads and the dry weight of the shoots. With *S. columbaria* and *S. gramuntia* at high ground water table the relative numbers of flower-heads of high, low and no fertilizer treatments were like 9:2:1 (Fig. 3).
- At high fertilizer treatment the flowering began on the average four to eight days earlier than in the other treatments.
- The life-span of plants at high fertilizer treatment was shorter than that of poorly or not at all fertilized ones, particularly in *S. columbaria*.

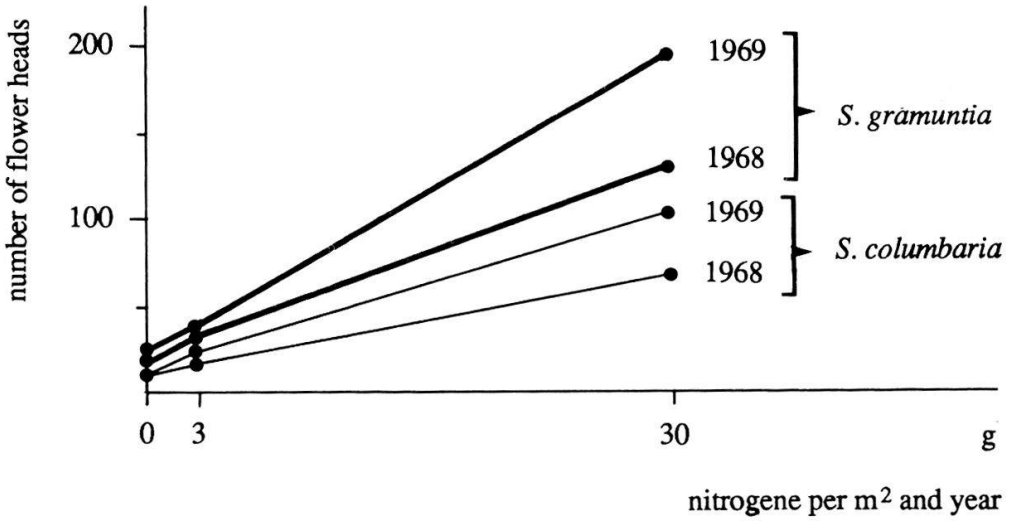

Fig. 3. Number of flower heads at different stages of fertilizer treatment and high ground water level.
Köpfchenzahl bei verschiedenen Düngungsstufen und hohem Wasserstand.

3.3. Influence of ground water table and irrigation

- The effects of the ground water table were influenced by irrigation and fertilizer treatment.
- A high water table level reduced the rooting space and was particularly unfavourable for *S. gramuntia.*
- A low water table level inhibited the growth of *S. columbaria,* in particular within the series irrigated at 28 day intervals.

3.4. Influence of temperature

- At high temperature the shoot weights of *S. columbaria* and *S. gramuntia* were nearly twice those at low temperature. With *S. lucida* hardly any differences could be observed (Fig. 4).
- With all three species the root weight under cool conditions was about twice that under warm conditions (Fig. 4).
- The root/shoot ratio is larger under cool conditions than under warm conditions. It increases in the following order: *S. gramuntia* - *S. columbaria* - *S. lucida* (Fig. 4).
- With *S. columbaria* and *S. gramuntia* the flowering began two to three

months later under cool conditions than under warm conditions. With *S. lucida* the respective delay was only about one month.

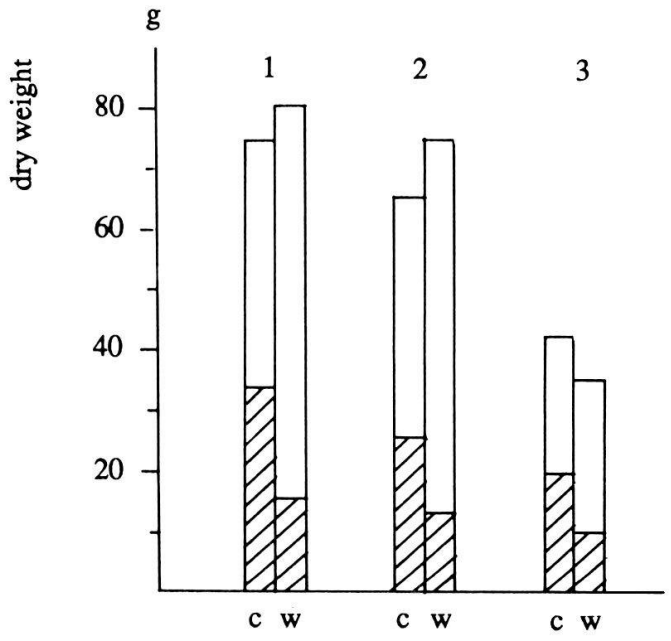

Fig. 4. Influence of temperature on weight of shoots and roots.
Einfluss der Temperatur auf das Spross und Wurzelgewicht.

1 *S. columbaria*
2 *S. gramuntia*
3 *S. lucida*

c cool temperatures (17°C /7°C)
w warm temperatures (30°C /20°C)

shoot weight
root weight

3.5. Competition experiments

- In mixed culture all three species were most competitive under those conditions, where they showed the best relative growth in pure culture.
- Because of its strong growth, *S. gramuntia* was vegetatively the most successful competitor under nearly all experimental conditions.
- The competitive potential of *S. gramuntia* versus *S. columbaria* was particularly strong under conditions with a low water table level and simultaneously a strong fertilizer treatment or irrigation intervals of 28 days; under these conditions *S. gramuntia* produced five to seven times more flower-heads than *S. columbaria* (in the respective pure cultures it was only two or three times more).

- *S. gramuntia* grown in mixed culture with a high water table level and low fertilizer treatment produced about twice as many flower-heads as *S. columbaria*; in pure culture it was only about 11/2 times as many.
- Differences occurring between mixed cultures and pure cultures in the greenhouse were not very pronounced and in general statistically insignificant. However, under these same conditions a correlation seems to exist between the growth in pure culture and the vegetative competition; accordingly, the following sequence of the competition potential can be established: *S. gramuntia* ≥ *S. columbaria* ≥ *S. lucida.*
- Under cool conditions *S. lucida* has an advantage over the other two species in so far as its fruit comes to maturity, whereas a large proportion of that of the other species do not ripen.

4. RESULTS OF PART II

The results of part II are summarized in the Figs. 32 to 40.

4.1. Variability of the characteristics under identical and differing conditions

The variability is shown for each characteristic under warm and cool conditions and from the ground water table experiment under the combination of low water table level and high fertilization. These examples are also representative for other conditions.

4.1.1. Hair density (Figs. 5 to 7)

Variability of hair density is in all three species not very high. Within the first three years hair density remains quite stable. Also under differing conditions there is not much variation within each species. Only *S. columbaria* and *S. lucida* show a slightly higher density under warm conditions compared with cool ones. But the difference is insignificant (Tables 7 and 8).
After 1970 the first generation of crossings were fully grown. Therefore the measurements included this mixed generation as well as the pure species. The total variability is very high, as expected. It reduces after 1973 to the smallest levels in 1985 (for the greenhouse conditions) and in 1979 (for the ground water plots). The higher variability in 1983 for these populations is probably due to the matu-