Introduction

1. Introduction

In central Europe, both fir and beech occupy areas with oceanic climate. In the extreme continental areas both are absent. Beech grows well between altitudes of 600 and 1000 m a.s.l. in the northern alps though it occurs also above and below these elevations. In the colline zone (till 600 m), beech forms mixed forests with other broad leaved trees, in the lower montane zone (600 - 800 m), it dominates forming nearly pure forests and towards the beginning of middle (800 - 1000 m) and upper montane zone (1000 - 1300 m), it forms mixed forests with fir (Abieti-Fagetum) (KUOCH 1954, ELLENBERG 1963). Fir has a more limited altitudinal distribution. The upper montane zone (1000 - 1300 m) forms a realm of its dominance and optimum growth. According to ELLENBERG (1963) pure fir forests under natural conditions occur only at places where beech growth is inhibited by extreme wet or dry conditions, winter frosts, short vegetation period or competition. Its ecological amplitude with respect to frost tolerance lies in between that of beech and spruce (Picea abies).

ELLENBERG (1963) states that fir and beech grow on all types of underlaying parent materials though beech prefers calcareous soils. RUEBEL (1923), therefore, referred to beech as eurecic. PFADENHAUER's (1971) comparative study of plateau fir forests in the Aargauer Swiss Midlands endorsed clearly that fir dominated forests occur on imperfectly drained acidic soils while beech dominated ones on normally drained and mostly base-rich soils.

KUOCH (1954) characterized the forest communities in the distributional area of fir in the Alps and Jura mountains. BACH et al. (1954) supplimented KUOCH's work by studying soil profiles under these forest communities.

In the northern Swiss Prealps, fir and beech form different stands adjacent to each other. Factors leading to such a distributional pattern were not yet worked out. Therefore, in the present work, the problem "Ecological conditions limiting the distribution of Fagus silvatica and Abies alba" was studied in the northern Swiss Prealps. As a study site, the Guberwald (Schwarzenberg) near Lucerne (Fig. 1), which lies in the middle montane zone (800 - 1000 m) where oceanity of climate favours fir-beech forests, was chosen. SCHMID

(1961) and ELLENBERG (1963) characterize this zone by the presence of species such as Abies alba, Fagus silvatica, Elymus europaeus, Prenanthes purpurea, Rununculus lanuginosus, Veronica latifolia etc. which are all present in the Guberwald.

A general survey of the area showed a pronounced mosaicness of the vegetation. This fact gave rise to the main theme of the investigations which is: Why is there such a mosaicness of the vegetation in the Guberwald and particularly, what are presumably the main factors responsible for the distribution pattern of beech and fir in the area?

Stands of fir and mixed fir beech forests are found adjacent to each other at the same elevation, slope and aspect. Therefore, climate does not seem to be responsible for the distributional pattern of fir and beech in this area. Clear demarcations between fir and beech stands are observed on south slope. Therefore, the main investigations were centered on this slope. The pattern of fir and beech distribution seems to be controlled mainly by edaphical factors and to some extent by human influence.

An evaluation of habitat conditions as shown by indicator plants and plant communities is useful in solving a problem of the kind mentioned above. PFADENHAUER (1971) and KOVACS (1970) have already characterized vegetation complexes of a comparatively smaller forest area on the basis of indicator plant communities. Therefore, as a basis for detailed investigation, a phytosociological survey of the area was made. The pattern of distribution of indicator plants showed that soil conditions differ from fir stands to fir-beech stands. Thus the main emphasis of the investigations was centered on the study of soil factors on the distribution of fir and beech in the investigation area.

The following pedological factors were studied:

1. Soil profiles: to assess preliminary information about soil types, sequence of horizon, morphological status, etc.
2. Water relations in the soils: It was thought that availability of water in the different soils could influence the distribution of fir and beech in the Guberwald. To test this hypothesis, water desorption curves and courses of tension in the field were studied.

3. Nutrient content of the soils: A analysis of the soils in respect to the main plant nutrients as well as nitrogen mineralisation was carried out.

Generally, nutrient and water regime govern the seedling establishment. Therefore, the following aspects of autecology of fir and beech were considered important in the present investigations:

1. Germination experimants: Experiments were carried out in the field as well as in the greenhouse.
2. Root system and root/shoot ratio.
3. Height and diameter increment of the saplings:These parameters give important information about the physiology and competitive ability of beech and fir on the different soils.

Thus it is assumed that the present investigations would give a better understanding of the competitive ability of fir and beech on different site conditions in the Guberwald.

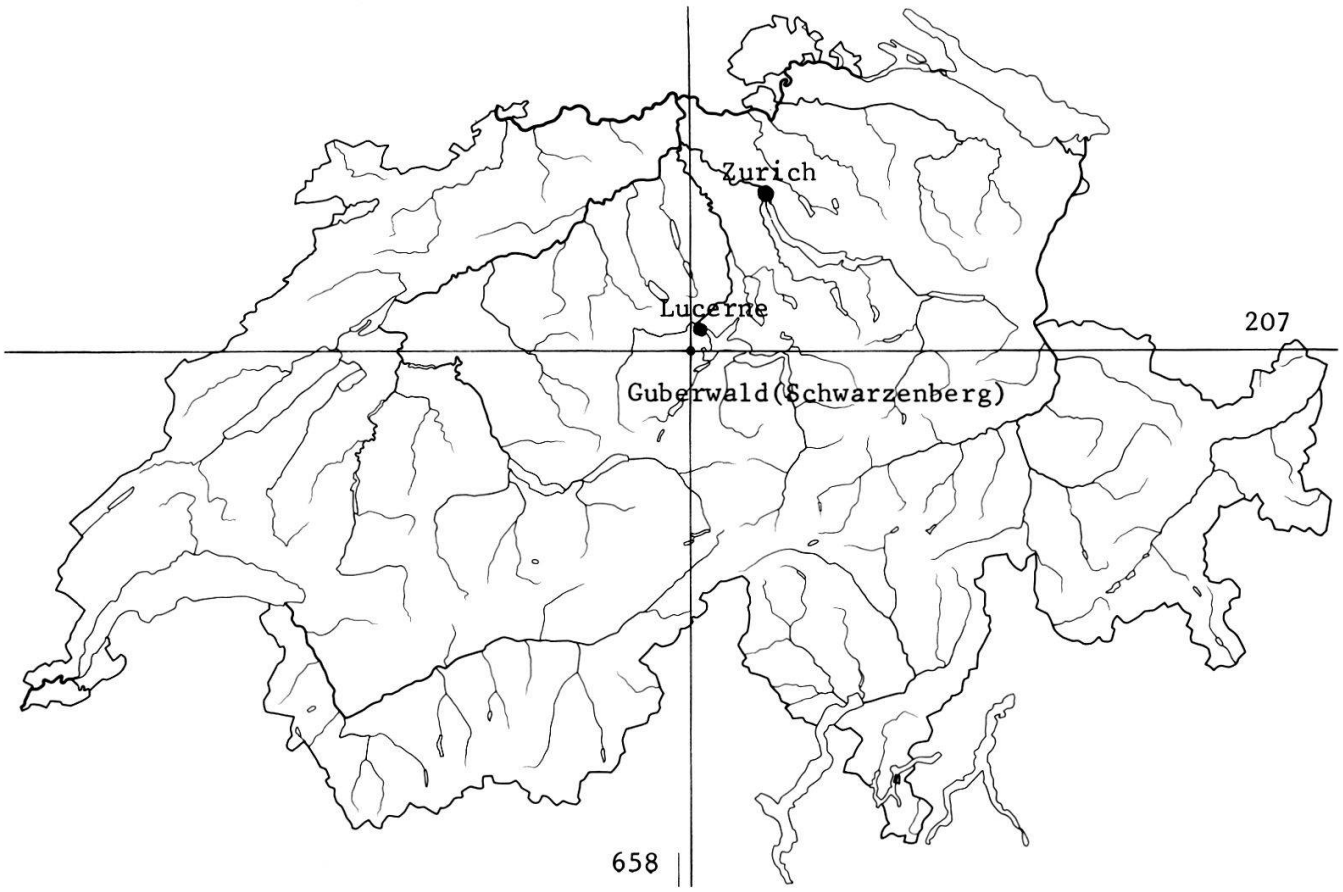

Fig. 1, Location of Guberwald (Schwarzenberg) in Switzerland.

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