# Selection advance and environmental variance in clonal selection of the wine grape variety Kövidinka

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S u m m a r y : The wine grape variety Kövidinka has been cultivated in Hungary for centuries. Clones were obtained using the 4-step method of NÉMETH and some clones showed considerable selection advance. The performance of 2nd vegetative progenies of the selected clones were evaluated over 7 years (1981-1988) based on the following characters:

| | |
|---|---|
| growth vigour of the stock | tendril atrophy |
| fertility of buds | millerandage |
| grape yield | berry rot |
| mean grape weight | sugar and acid content of the must |

Mathematical evaluations of the characters can give useful information as to the performance of the clone stocks. In the years of the study, large environmental variation was observed in the tested characters. At the same time, the slight environmental variation found in some individuals indicated their genetic stability. They will be selected and propagated as sub-clones in the future.

K e y w o r d s : variety of vine, Hungary, clone, selection, performance, modificability, mutation, genetics.

## Introduction

In the selection of wine grape clones, breeding work is greatly encumbered by environmental effects. In natural surroundings, grapevine stocks cultivated during centuries in the same area tend to change in morphology and inner characters due to selection pressure. The stand turns heterogeneous with one stock becoming weak and susceptible to diseases and with the other maintaining its original character (BALINT 1977; VIDA 1981). But some stocks can also be found which exhibit positive changes. Changes are expressed in the phenotype and, if fixed in the genotype and manifested through generations of clones, they could be very valuable.

Whether the positive properties, expressed as morphological or internal characters of a clone, are caused by modifications or changes fixed in the genotype (mutation), can be proved by clone selection of several steps.

In our Institute, clonal selection has been performed with good success in table and wine grape varieties for several decades (HAJDU 1980, 1988; FÜRI and NÉMETH 1972).

Of the cloned varieties, I want to present the effect of some environmental factors on the wine grape variety Kövidinka on the mean of years and clones, first within the population and then at stock level.

## Material and method

The cloned variety Kövidinka is usually cultivated in the largest wine district of Hungary, on the Great Plains, corresponding to 45 % of the vine area of the country. The variety is well adapted to extreme conditions. It can be grown on sandy soils under arid conditions. It is productive, sensitive to frosts but regenerates easily. Both primary and secondary buds are fertile. It yields an ordinary white wine.

Clonal selection began in 1963 (KWAYSSER and KISHONTI 1965); following the 4-step clonal selection method of NÉMETH was used (NÉMETH 1967; HAJDU 1980,). In the past 25 years, 3 valuable clones (8/59, 10/60, and 11/59) were selected and propagated from the mother stocks (HAJDU 1988). Stock performance of the selected clones was studied in the 2nd vegetative generation during 7 years from 1981 to 1988 in a row design. In the year 1987 frost damage thwarted evaluation. High cordon training and Sylvoz pruning method was used with 12-14 buds/m$^2$. The trial site was level with a sandy soil.

In the clone and control stocks the following parameters were studied:

| | |
|---|---|
| growth vigour and health of stocks | tendril atrophy |
| bud fertility | millerandage |
| cluster yield | rot of berries |
| mean cluster size | sugar content and acidity of the must |

The data obtained give useful information as to the performance of stocks and correlation of the characters studied.

## Results

High environmental variations were observed in the characters studied between the different years. Stocks were symptomatically healthy. Several stocks were found which varied little when exposed to different environmental effects, that is, they were genetically stable.

Evaluation means and deviations are represented in Figs. 1-7 to simplify their analyses.

Fig. 1 shows the performance of the selected Kövidinka clones with 60 stocks/clone related to the control in correlation of 9 characters and averaged over 7 years. Besides qualitative and quantitative mean values, their deviations were also taken into account. In most characters the clone 8/59 was superior. Here deviations showed variations in stock performance on the mean of years.

Fig. 2 represents the yearly variation of the studied characters with means calculated from all the stocks in the clone trial. Stock means and deviations are given for every year. In most characters, high variations were observed between years. The absolute bud fertility coefficient was relatively stable, independent of years. The growth vigour of stocks was uniform except in 1988 when winter frosts intervened. Millerandage, rot and tendril atrophy varied highly in the years. Mean cluster weight did not follow that high variation. Fig. 2 reveals clearly the year when high values were found for a studied character. That year is also most efficient for selection. For

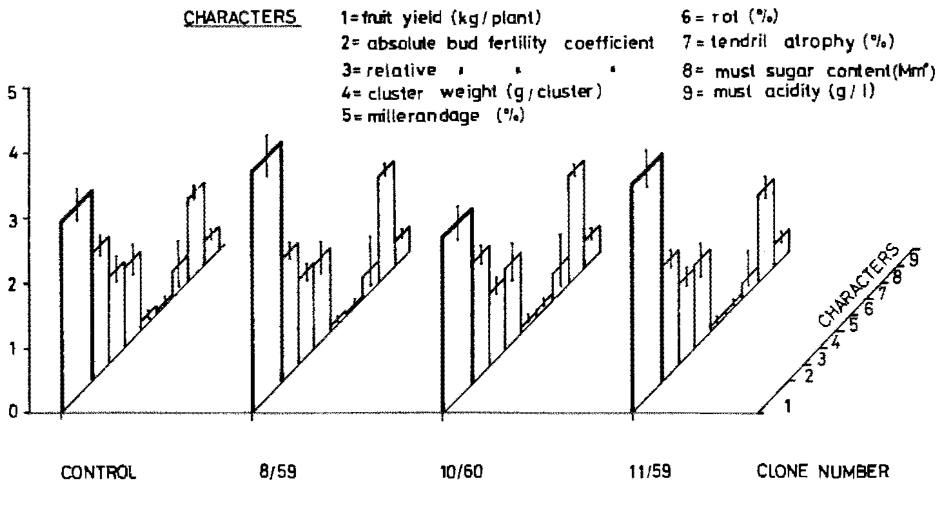


Fig. 1: 7-year means and distribution of qualitative and quantitative characters in Kövidinka clones and control. Kecskemét-Miklóstelep.

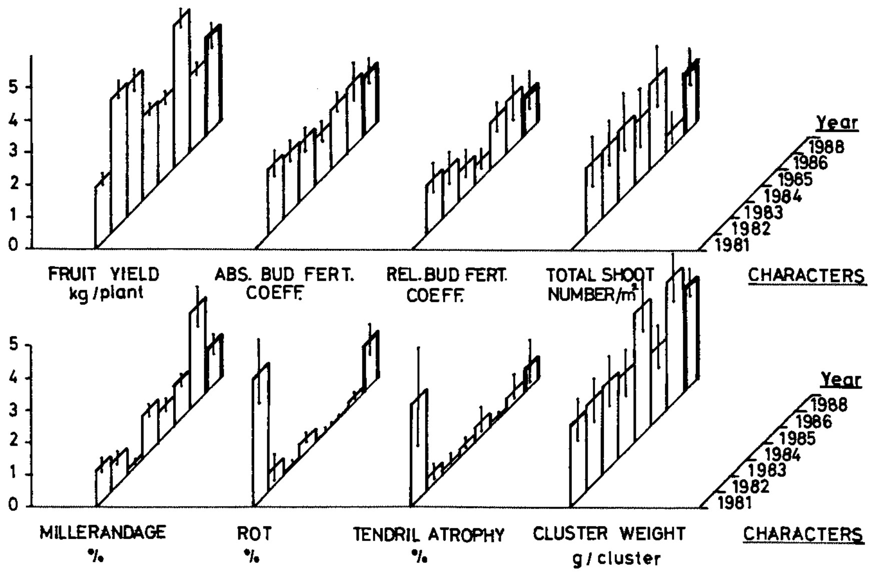


Fig. 2: Changes and distribution of quantitative characters in the mean of Kövidinka clones and control during 7 years. Kecskemét-Miklóstelep.

instance: for cluster weight, bud fertility, cluster size and stock vigour, 1986 and 1988 proved to be very advantageous. For selection for millerandage and tendril atrophy, the years 1981 and 1986 were suitable. That is, it was in those years that highest mean and deviation values were observed in the studied characters.

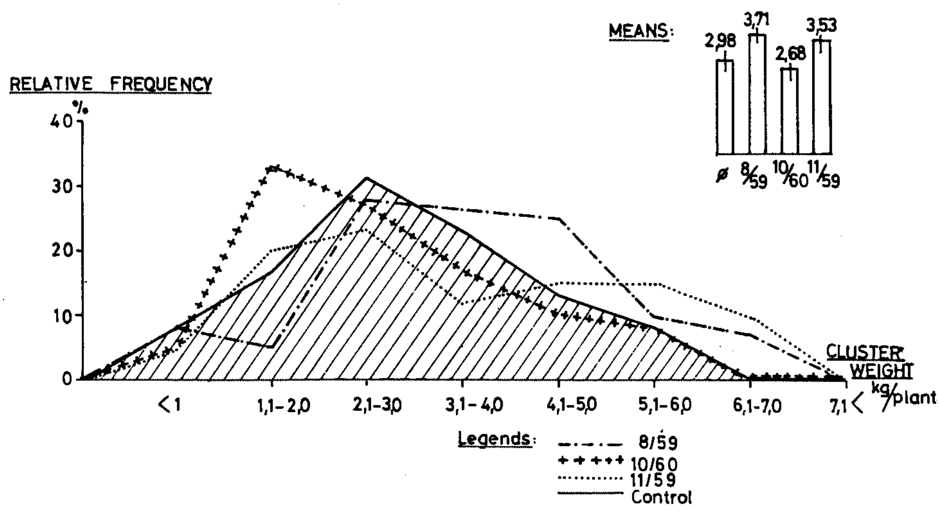


Fig. 3: Plant distribution of Kövidinka clones and control based on 7-year yield data. Kecskemét-Miklóstelep.

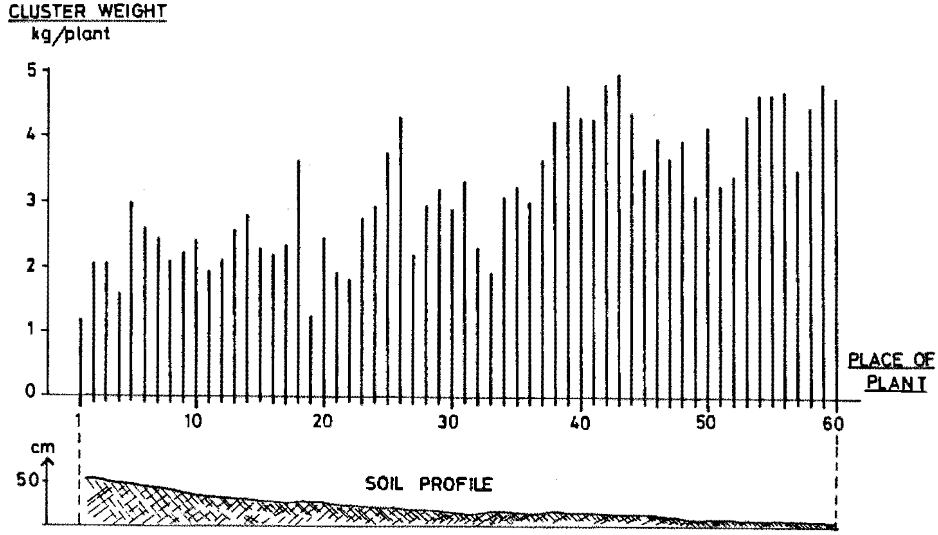


Fig. 4: Cluster weight of Kövidinka plants in the mean of 7 years and clones depending on their place in the trial. Kecskemét-Miklóstelep.

Fig. 3 shows the distribution of stocks according to cluster yield within clones and control populations, respectively. Related to control data, the highest selection advance was obtained in the clone 8/59 and 11/59, respectively. In both clone populations, more stocks of high yields were found than in the control or in the clone 10/60.

Evaluating the 7-year means of cluster yield/stock according to the place of stocks within the rows of the trial area, correlation was found between soil surface condition and cluster yield on a

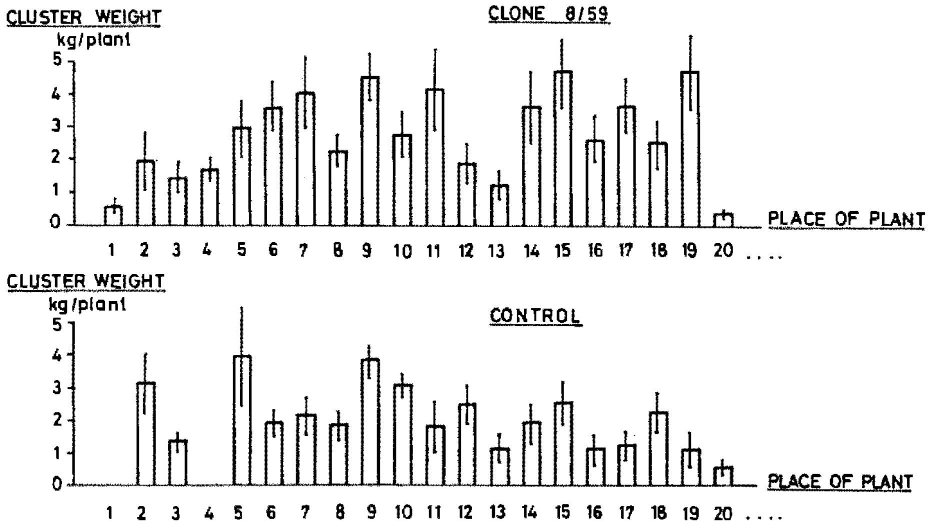


Fig. 5: Cluster weight mean and distribution of Kövidinka 8/59 clone and control depending on the place of the plants. Kecskemét-Miklóstelep.

homogeneous soil with slight slope (0.3 % slope). The lines in the upper part of Fig. 4 represent cluster yield and those at the bottom the soil slope. The effect of soil surface level was evaluated for each character, correlation is, however, most convincingly manifested in cluster yield. Stocks situated deeper in a different microclimate may have a better access to water table and accordingly superior nutrient utilization.

The cluster yield of stocks was analysed as to their place in the row. In Fig. 5 we can see the mean yield and deviation values of the clone 8/59 and that of the control from the 1st to the 20th stock, one after the other, in the row. Of course, the best stock is the one with the highest mean values and lowest deviation, that is, with a consistent yield. In this clone, more highly productive stocks can be found than in the control.

The relative frequencies of cluster weight for the entire stand in the clone trial are indicated in Fig. 6. Yield means in the 7 years are grouped according to their frequency. Below the principal means, the cluster yield of 5 stocks in the clone 8/59 and that of 5 control stocks are given for each year. Data help to choose stocks which produce a stable number of clusters – low or high – independent of environment.

Besides climatic conditions, nutrients play an important part in yield. In the clone trial, uniform nutrient supply was provided. We wanted to establish whether there was a difference between nutrient uptake and utilization in these stocks. Leaf samples were taken 3 times from each stock. Unfortunately, data of only 1 year are available.

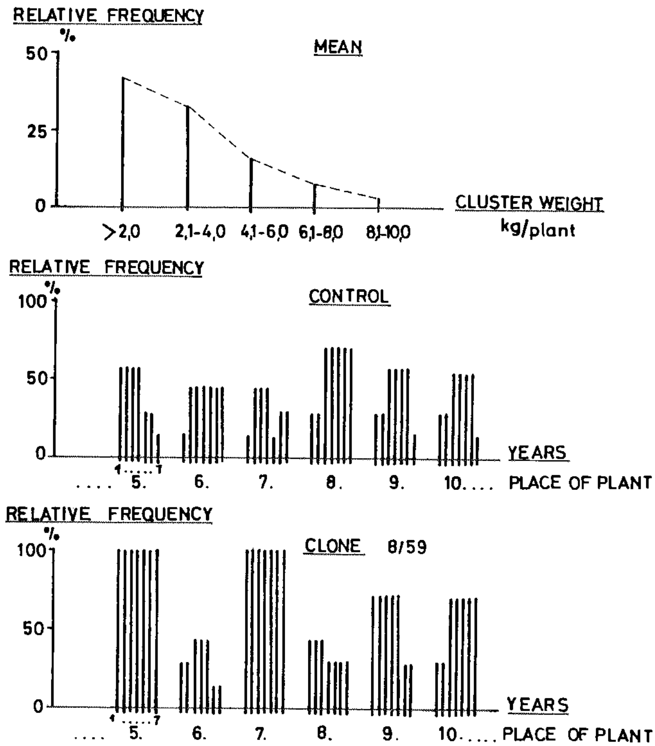


Fig. 6: Distribution of Kövidinka clone 8/59 and control based on their cluster weight depending on the place of plants over 7 years. Kecskemét-Miklóstelep.

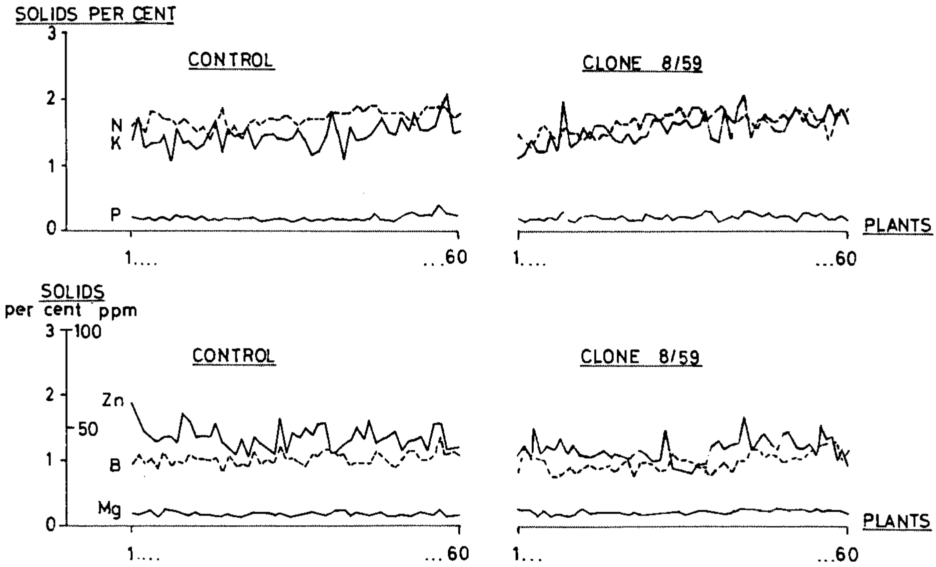


Fig. 7: Leaf analysis results of Kövidinka clone 8/59 and control plants in 1988. Kecskemét-Miklóstelep.

Values of the most important nutrients, N, P, K, Mg, B and Zn, are shown in Fig. 7. Zn and Mg uptake of stocks was almost identical while that of N, P and, particularly, K varied. The phenomenon can be explained by differences in the root system and assimilation. It is very interesting over the life of a stock or a clone. There are individuals of good nutrient uptake and utilization and individuals of poor nutrient uptake and utilization.

## Conclusion

The statements are based on observations of the wine grape variety Kövidinka in the 3rd step of clone selection where the 2nd clone generation of selected mother stocks was studied for 10 characters. In the entire plantation, clones were superior to the control in every character. When studying single stocks, high environmental variance was found for several characters in the mean of 7 years, but only the evolution of cluster yield is presented. Depending on environment (year, soil conditions) typical phenotypic variations were observed.

Under identical environmental conditions, the stability of phenotypic variance in the stocks assists in selecting individuals of superior genotype. A thorough knowledge of the stocks and the elimination of environmental variances will allow the selection and propagation of the best clones. Phenotypic variances due to environmental changes and genotypes can also be evaluated in other wine grapes.

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# Application of mutagenesis in important varieties and evaluation of new clones

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A b s t r a c t : The objectives of the Geisenheim mutation breeding programme is to enlarge the spectrum of genetic variation for selection of improved clones in a limited number of characteristics. 1- year-old grafted vines were treated with X-rays and fast neutrons during dormancy just before bud burst. Rootstocks and base of the grafted vines were shielded. Among varieties irradiated with 2-6 kR were the following: White Riesling clone 239-25 Gm, White Riesling clone 110-18 Gm, Müller-Thurgau clone 6-8 Gm, Ruländer (Pinot gris) clone 2 Gm, Blauer Spätburgunder (Pinot noir) clone 20 Gm and Silvaner, Gewürztraminer, Chardonnay and Trollinger (most Geisenheim clones). Grafted and rooted vines were found to tolerate higher doses of radiation than unrooted cuttings. In $M_1V_2$ many chimeric and non-chimeric variant shoots could be observed.

Stable periclinal chimeras were obtained in White Riesling and Trollinger after irradiation. Out of irradiated Ruländer, mutants of Weisser Burgunder (Pinot blanc) type were selected. In another experiment using 1500 rad of fast neutrons, mutants with the characteristics of Blauer Spätburgunder (Pinot noir) were found. Within progenies of irradiated Blauer Spätburgunder early ripening types with dark skin berries were discovered. After microvinification some of them were scored to produce better wines. Some new mutant clones under evaluation show interesting properties with regard to stem rot, berry botrytis, yield and quality. The best new mutant clones of White Riesling, Müller-Thurgau and Pinot noir are already in propagation for further evaluation.