# ABSTRACT

**Key words**: *new varieties, grapes for white wines, agrobiological, technological particularities*

The doctoral thesis "***Research on the agrobiological and technological potential of grapevine varieties for white wines created at the Research-Development Station for Viticulture and Vinification Odobeşti***" falls within the general context of researchs on the agrobiological value of vine varieties for white wine, to highlight the most valuable ones, with higher productive and qualitative potential than those existing in the culture, to adapted to climatic conditions which are constantly changing.

The thesis´s purpose is to evaluate the agrobiological and technological potential of four grape varieties for wines, created at Research and Development for Viticulture and wine-making Odobeşti: Şarba, Băbeasca gri, Mioriţa, and Vrancea, as compared with Fetească regală variety.

The doctoral thesis summarizes a number of 199 pages, being structured in ten chapters, which include a number of 54 tables, 61 figures and color photographs and 151 bibliographic titles. First part of the paper work, concerning the current state of knowledge of the issues covered, includes introduction and the first three chapters, and the second part represents the results of own researchs, presented in seven chapters, final conclusions, recommendations and bibliographic consulted.

In the **first Chapter** entitled "*General considerations on the growth of varieties for wine grapes*" is presented a summary of the bibliographic data regarding to the importance of varieties for wine grapes, the main areas of cultivation and the situation of yields and the areas occupied in Romania, as well as the structure of the assortment of varieties currently cultivated in our country, and in the **second Chapter**, reference is made to the main agrobiological, technological characteristics and the growing particularities of wine grape varieties.

The ecosystem characterisation from Odobești vineyard is presented in detail in **Chapter III,** in both climatic aspect as well as in terms of geomorphological factors and geographic location. Synthesis of data for 1970-2019 period, confirms us that conditions the habitat of the vine are fulfilled, in terms of support factors (litho-morpho-pedological) and external (bioclimatic), ensuring optimal conditions for grape ripening. Comparatively with the multiannual values is
found an enhancement of the thermal regime and insolation, and a decrease of hydric regime which is distributed unevenly, represented through brief torrential rains alternating with long periods of drought.

The second part of the thesis, that includes personal researches, starts with **Chapter IV** entitled: *„Research purpose and objectives"* in which are presented considerations concerning the purpose and objectives of the paper work diveded by activities. Studies were focussed on solving the following objectives:

- ✓ Study of biotope factors for the 2020-2022 period;
- ✓ Evaluation of resistance to abiotic factors (frost and drought);
- ✓ Behavior evaluation to biotic factors (diseases and pests);
- ✓ The study of fertility and productivity for varieties studied;
- ✓ Study of some physiological indexes;
- ✓ Study on the ripening process of grapes;
- ✓ Study of some physical properties of grapes;
- ✓ The study of chemical properties of the must;

In **Chapter V** are presented the organizational and institutional framework of the research activities, material and methods of investigation. Experiments for the attainment of the objectives of the doctoral thesis were carried out at the Research and Development Station for Viticulture and Wine-making Odobești. Biological material is represented by four varieties for white wines created by S.C.D.V.V. Odobești (Şarba, Băbeasca gri, Mioriţa, and Vrancea), compared to the control variety

Fetească regală. Each variety is grown over an area of 0.20 ha, and crop technology was specific for wine grape varieties recommended in wine-growing area in which the research station is located.

Experimental lots where the research has been conducted were established in 2010-2012, on flat fields (in plateau) with exhibition predominantly southern, without being exposed to the risk climatic factors, being in full capacity of fruiting.

The rootstock used for grafting was Berladieri x Riparia Selection Oppenheim 4, clone 4 (SO4-4). The cultivation system used was the half height strains (80 cm), hubs being led in the form of a bilateral cordon, with spurs safe at their base, for semiprotection of them during the winter. The row number of hubs is 60 of each variety, 20 hubs per repetition, and the distance between them is 1,2 m and row spacing is 2,2 m. The soil maintenance system is the black field, and the cultural maintenance measures of it are in accordance with the technologies recommended in the wine-growing area of the Odobeşti vineyard.

The last part of this chapter is the most extensive and presents in detail the researchs methods used in the evaluation of agrobiological peculiarities, of physiological indexes and technological peculiarities.

In **Chapter VI** entitled "*Study of biotope factors concerning the favorability of growing new grape varieties for white wines in the South area of Moldova*" are presented the climatic conditions from the period studied 2020-2022, characterized by prolonged drought (2020 and 2022), a record number of days, with temperatures >30°C, the absolute minimum temperatures above freezing vineyards (- 15.0 °C in the air and - 17.8 °C at the surface of the soil in 2021), heavy rainfall in a short period (2021), without deposits of ice or hail. Physico-chemical characterization of the soils in the experimental plots is also presented.

The results concerning the agrobiological characteristics of varieties Şarba, Băbeasca gri, Mioriţa, and Vrancea are reproduced in **Chapter VII**.

The vigor of growth assessed in terms of the quantity of wood annually and multi-annual removed by cutting in the years 2021 and 2022, for vegetative growth from 2020 and 2021, shows a lower growth in 2020, the studied varieties being affected by prolonged drought and a normal vigor, specific to each variety, in 2021. The same trend it was also manifested in the increase in the length of the shoots from the vegetation period, with lower values with 22-36 cm/shoot, toward 2021, considered climatically normal.

The fertility of the varieties studied, assessed by the percentage of fertile shoots, the coefficient of fertility absolute and relative, show that this is a worthy trait of genetic variety but also influenced by the climatic factors. The varieties studied concerned performing between 63.9% fertile shoots (Băbească gri) and 84.3% (Vrancea), absolute over unity fertility coefficients (1.07 Şarba variety, 1.11 Băbeasca gri variety, 1.18 Miorița variety and 1.50 Vrancea variety) and relative subunits Şarba (0.66 – 0.70), Băbeasca gri (0.68 – 0.73) and Miorița (0.70 – 0.83) varieties. In the Vrancea variety, the relative fertility coefficient had above-unit values of 1.16 – 1.33. These values were lower than the control variety.

Productivity expressed by the index absolute IPA and relative IPR, presented different values from one variety to another but also from one year to the next, which includes the enhancement of values through the IPA, the Miorita variety (344) in 2022, and in 2021 Băbeasca gri variety (311), but also Şarba variety (296), upper then control variety Fetească regală, results supported by the statistics-mathematics analysis, as being very significant. The index of relative productivity (IRP) indicator of average production of each shoot, had values between 183 Şarba variety and 201 for Miorița variety, lower in 2020, as a result of unfavorable climatic conditions, values lower than control variety.

The development of the vegetation phenophazes took place in a logical progression, the beginning of vegetation and is marked by the budburst phenophaze, between April 10 (2020) - May 4 (2021), in the conditions of a useful heat balance (BTU) between 12,2 °C and 60.3 °C, the flowering between May 29 (2022) and June 14 (2021), in which the balance sheet useful heat (BTU) was between 248.1 °C and 318.0 °C, veraison occurred in the range from July 27 (2022) – August 19 (2021), the useful heat balance being between 776.2 °C and 964.2 °C. The full ripening of the grapes was marked, in each year of study, by the

Vrancea variety, starting on August 28 (2022), followed 3-4 days later by Şarba variety, the earliest on September 2 (2022). The varieties Miorița and Băbeasca gri reached full maturity at the earliest on 9 and 11 September (2022) and at latest on 25 and 23 September (2021), with 8-16 days later than the control variety Fetească regală.

Behavior to frost of the varieties studied has been specific to the *Vinifera* species, the results obtained revealing insignificant losses of main buds in 2020 ranging between 2% (Băbească gri) and 11% (Şarba) in conditions of absolute minimum temperatures of -9.8°C in the air and -11.6°C on the soil surface, and in 2021, the proportion of the main buds affected was of 8 to 14%, under absolute minimum temperatures of -15.0°C in the air and -17.8 °C on the ground. The most sensitive turned out to be Şarba variety with a percentage of viable main buds of 86% as well as the control variety Fetească regală. Vrancea and Miorita varieties showed good viability with a percentage of viable main eyes of 92%.

Research conducted in 2020 regarding drought resistance revealed that all the varieties was affected in terms of vegetation increases, fertility and productivity, production quality, instilling fading phenomen and premature yellowing of the leaves. Regarding the reaction to attack of the main diseases of the grapevine, it was noted in the conditions for applying a different number, from year to year, of anti-cryptogamic treatments, the varieties studied were appreciated by the OIV scale resistance (according to the degree of attack), ranging from 8-9 for manna attack, Powdery Mildew on the leaves and grapes and Gray rot (*Botrytis*) on grapes, with no differences compared to the control.

In **Chapter VIII** entitled "*Studies on the value of some physiological indices of the varieties studied*" data are presented on the content in assimilatory pigments (chlorophyll a + b + carotenoids), the intensity of photosynthesis and rate of transpiration. The results obtained reveal Vrancea variety as having the highest capacity to assimilate them (2.71 mg/g leaf), followed by Şarba variety (2.43 mg/g leaf), upper than the control. The lowest quantitative values was recorded at Băbească gri and Miorița varieties. It can be noted on upper values of photosynthetic activity of leaves and the transpiration rate at the end of flowering period at all the varieties concerned, the greatest amount of these processes registering at Şarba variety followed by Vrancea variety, superior to control variety. The varieties Băbească gri and Miorița recorded average values of the photosynthetic intensity of 7.75 and 7.21 [µmol· m-2 ·s-1] respectively, lower than control variety.

The technological particularities of Şarba, Băbeasca gri, Miorița and Vrancea varieties, are shown in **Chapter IX**. The dynamics of the grape ripening process shows the highest percentage increase in the mass index of 100 berries in Băbească gri variety (44.3.0%), and the lowest in Şarba and Vrancea varieties (23.9%), the highest percentage increase in sugar content was recorded in Băbească gri variety (213.7%) and the lowest in Vrancea variety (159.7%). Miorița variety has the highest percentage decrease in acidity (37.6 % of the initial acidity), and the smallest decrease is recorded in Vrancea variety (49.1% of the initial acidity).

The results concerning the elements of production highlight their ability to form and produce on average 19.9-37.9 grapes/hub, to the loads of fruit approximately equal. Average weight of a grape recorded average values greater at varieties Băbească gri (271.4 g), Şarba (265.9 g) and Miorița (259.9 g) upper control variety Fetească regală (156.7 g/grape). In Vrancea variety, average mass of a grape was 153.7 g/grape, close to control variety.

Average yields of grapes determined ranking at first place Miorița variety with 6.18 kg/hub, respectively 22.85 t/ha, followed by Băbească gri variety with 6.08 kg/hub, respectively 22.49 t/ha, differences from the control being significantly negative. The Vrancea variety, with a lower fruit load than previous varieties, achieved an average production of 5.80 kg/hub, respectively 21.45 t/ha, falling within the production parameters confirmed at homologation, difference compared to the control being distinct significantly negative. The lowest production was recorded at Şarba variety with average of 5.20 kg/hub, respectively 19.23 t/ha, difference to control was secured statistico very significantly negative.

Physical-mechanical analysis of grapes highlights Miorița variety followed by Băbească gri and Șarba varieties with an average number of berries/kg grapes of 399.0 and 464.7 respectively 465.3 with a total mass of 974.6 g and 975.3 g and 973.0 g, respectively, superior to Fetească regală variety. The mechanical analysis of 100 berries shows that Miorița, Șarba and Băbeasca gri varieties produced grains of over 2 g/berry (2.36 - 2.60 g), the difference compared to control being very significantly positive. Number of seeds in berry varied between 1.88 (Vrancea) and 2.63 (Miorița), the skin represented between 7.5 and 9.9% of mass of the berry, and the quantity of fruit pulpexceed the limit minimum of 73%, being between 87.1% (Șarba) and 89.4% (Miorița), values below the control variety (91.0%).

Technological indexes expressing technological and economic value of the studied varieties complete quality traits, indicating Vrancea variety with grape composition index of 42.2, higher than Băbească gri (39.5), Șarba (38.7) and Miorița (36.3), upper than control variety (32.2). The berry index places Miorița variety first (39.90) followed by Șarba and Băbească gri varieties with close values (46.53 and 46.47 respectively). The berry composition index had average values between 6.84 (Șarba) and 8.76 (Miorița), specific values for wine grape varieties. Of the four varieties studied, Miorita variety stands out with the highest value of the yield index (4.64), superior to control variety (4.29), the lowest value was recorded by Vrancea variety (3.55). Technological indices resulting from the physical-mechanical analysis of a kilogram of grapes highlight the fact that the four varieties can fall into the category of varieties for valuable wine grapes, producing well-formed grapes with a high berries yield.

Chemical composition analysis of musts of varieties studied highlights different accumulations from one variety to another as well as from one year to another. The variety Șarba stood out for its higher sugar accumulation potential (232.4 g/L), under the conditions of an average acidity of 6.24 g/l $C_4H_6O_6$, the difference compared to control variety being statistically ensured as very significantly positive. Băbească gri variety, recorded high accumulations in sugars (218.3 g/L), under the conditions of an average acidity of 7.53 g/L $C_4H_6O_6$, the difference compared to the distinctly positive control. Accumulations in sugars to Vrancea variety, oscillated between 203.3 and 221.4 g/L, difference compared to control variety Fetească regală being significant, under the conditions of an average acidity of 5.51 g/l $C_4H_6O_6$. The lowest accumulation in sugars was recorded by Miorița variety with average value of 183.7 g/l, and total acidity of 6.73 g/l $C_4H_6O_6$, the difference compared to the control being insignificant.

Balance between sugars and acidity of must is also highlighted by the value of gluco-acidimetric index, which in 2020 and 2022 was very high, 46 (Băbească gri) and 68 (Șarba), due to low acidity of must, and lower in 2021 between 33 (Miorița) and 50 (Vrancea), which ensure obtaining of quality wines.

The content of total polyphenols as well as total polyphenolic index (IPT) had same distribution on varieties and harvest years, being superior to control in varieties Băbească gri with 0.32 - 0.36 g/L gallic acid respectively 3.4 - 4 ,0 (IPT), and Vrancea with 0.27 - 0.32 g/L gallic acid, respectively 3.5 - 3.9 (IPT) and lower in Miorița and Șarba, varieties with green - yellowish skin and core. The analysis of values obtained when determining the chemical composition of the must indicates that they were visibly influenced by level of climatic factors in period studied and genetic specificity of each analyzed variety.

The results of the observations and determinations carried out in the years of study, establishing ampelographic descriptors, are reproduced in **Chapter X** *"Ampelographic descriptors of the studied grape varieties"*, being used to complete and draw up the descriptive sheets of the studied varieties, establishing that they correspond to the characteristics presented for their approval and patenting. All these data give a complete picture of agrobiological and technological value of the Șarba, Băbească gri, Miorița, and Vrancea varieties, which allows recommendation and extend successfully in cultivation.