# THE BUD LOAD INFLUENCE ON THE QUALITY AND QUANTITY OF THE YIELD FOR PINOT GRIS VARIETY IN COPOU WINE CENTRE – IAŞI VINEYARD

## INFLUENŢA ÎNCĂRCĂTURII DE ROD ASUPRA CANTITĂŢII ŞI CALITĂŢII PRODUCŢIEI LA SOIUL PINOT GRIS ÎN CONDIŢIILE CENTRULUI VITICOL COPOU – PODGORIA IAŞI

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***Abstract***. *The bud load is the main factor that determines the expression of the agro-productive characteristics of the vine varieties, as well as biological equilibrium between vegetative development - fruitiness and quatinty – quality proportion. Increasing the bud load assures the augmentation of the yield up to a certain limit, beyond that the yield remain stable indifferent by the number of the buds left on the vine canes. The quality of the yield is a more variable parameter, this being influenced by numerous factors including bud load. The results of the experiences effectuated on Pinot Gris variety in Copou wine-growing centre – Iaşi vineyard, shows the complexity of the bud load – yield relationship: the quantity of the yield depends not only by the grapes number developed on the vine but also by their size, while the quality of the yield is determined above all by the exposed leaf area and in secondary by the number and size of the grapes of the vine.*

**Key words:** vineyard, pruning, bud load, grapes yield, sugar.

***Rezumat***. *Încărcătura de rod reprezintă factorul de care depinde exprimarea însuşirilor agroproductive ale soiurilor de viţă de vie şi realizarea echilibrului biologic în relaţiile creştere-fructificare şi cantitate-calitate. Amplificarea încărcăturii de rod permite creşterea producţiei până la un anumit nivel, după care, indiferent de numărul de muguri lăsaţi pe butuc, aceasta se menţine constantă. Calitatea strugurilor este un element mult mai mobil, fiind influenţată de un întreg complex de factori, în rândul cărora încărcătura de rod deţine un rol determinant. Rezultatele experienţelor efectuate la soiul Pinot gris în condiţiile centrului viticol Copou, relevă o dată în plus complexitatea relaţiei încărcătură de rod – producţie de struguri: mărimea producţiei depinde nu doar de numărul de struguri formaţi pe butuc ci şi de mărimea acestora; calitatea producţiei este condiţionată în primul rând de suprafaţa foliară expusă a butucului şi în mai mică măsură de mărimea producţiei.*

**Cuvinte cheie:** podgorie, tăiere de rodire, încărcătură de rod, producţie de struguri, zaharuri.

## INTRODUCTION

The widely known Pinot Gris grapevine variety has been recently authorized (2004) for cultivation in the north-eastern vineyards from Moldavia region, in order to produce white quality wines. The high resistance of this variety to frost (- 22…-24 ºC) and its short vegetative period (160 – 170 days) recommends it as one of the most suitable grapevine varieties for this region,

characterized by frosty winter, medium vegetative period (170 – 180 days) and relatively low annual average temperature (Oşlobeanu et.al,1991). Because of its biologically advantages this variety has been cultivated in the vineyards from this region on very restricted areas and it have been encountered as an impure in many plantations. But because of the legal restriction and especially because its limited productivity it haven't been promoted and extended in the vineyards. Also the are few research regarding the behavior of this variety in the Moldavian vineyards (Piţuc P. et al.,1974). Because of these reasons nowadays is required to study, to elaborate optimum technologies and to promote the growing of this worthwhile variety in Moldavian Viticultural region. Through this work paper we presents the results of some observations made in 2008 in Ampelographic Collection of Horticultural Faculty from Iaşi.

## MATERIAL AND METHOD

The experiences have been organized in 2008 on Pinot Gris variety in Ampelographic Collection of Horticultural Faculty from Iaşi. The trellising form is Cazenave Cordon with height of stem by 0.75 m, the planting distances by 2.2 m between the rows and 1.1 m between the vines on the row and monoplane trellising system. There were four experimental variants, each of them with a different bud load distributed on short canes of five winter buds: $V_1$ = 16 winter buds/vine; $V_2$ = 22 winter buds/vine; $V_3$ = 28 winter buds/vine; $V_4$ = 36 winter buds/vine. We have done the next analysis and determinations: *the number and the length of the shoots, total foliar surface, the exposed foliar surface, the fertility coefficients of the vines, the size of the grapes, the quantity of the yield, sugar content* and *acidity of the grapes.*

## RESULTS AND DISCUSSIONS

**1. Vegetative development of vines.** Pinot Gris is a low vigorous grapevine variety, with generally short and thin shoots, especially in meager soils. The Copou wine-growing centre soils are generally fertile, with a 2.82 % of humus content that stimulate the development of the shoots and sustain the vegetative development of the vines. This fact assures an increase of the bud load in order to obtain bigger yields. The number of shoots on the vine is directly correlated with the bud load left at pruning; when the bud load is lower, under the biological potential of the vine, a supplementary number of shoots appear from the dormant buds, as a tendency of the vine to create a the biological equilibrium between the root system and the vegetative system (Irimia L., Ţârdea C., 2001). The average length of the shoots is negatively correlated with their number: the longest ones are at the first variant and the shortest at the fourth variant (table 1).

The total leaf area developed by the vines was directly correlated with the bud load and the number of shoots developed on vines: the lowest total foliar surface was 2.20 $m^2$ at $V_1$ experimental variant, and the largest 3.70 $m^2$ at $V_4$ experimental variant. The exposed leaf area characteristic for the trellising system is 2.58 $m^2$ on the vine (Irimia, Ţârdea C., 2007).

*Table 1*

**The influence of the bud load on the development vegetative parameters of the vines at Pinot gris variety**

| Specification | Variant/Bud load | | | |
|---|---|---|---|---|
| | **$V_1$/16** | **$V_2$/22** | **$V_3$/28** | **$V_4$/36** |
| Number of shoots / vine | 24 | 29 | 34 | 39 |
| Supplementary shoots | 8 | 7 | 6 | 3 |
| Average length of shoots (m) | 1.36 | 1.28 | 1.12 | 0.88 |
| Total leaf area ($m^2$) | 2.20 | 2.86 | 3.42 | 3.70 |
| Exposed leaf area ($m^2$) | 2.58 | | | |
| Foliage excess ($m^2$) | 0.00 | 0.28 | 0.84 | 1.12 |
| Foliage exposure degree (%) | 100 | 90.2 | 75.43 | 69.72 |

The foliage excess is registered at the second, third and the fourth experimental variants. These register also a lower foliage exposure degree: 90.2% at $V_2$, 75.43 % at $V_3$ respectively 69.72 % at $V_4$. A rather optimum foliage exposure assure $V_2$ variant with 90.2% %, while $V_1$ doesn't use the entire extent offered by the trellising system. The vegetative development could be considered optimum at the $V_2$ experimental variant, with a normal development of shoots and parameters of the foliage; $V_1$ variant doesn't valorize the entire extent assured by the trellising system, while the third and fourth variants has a dense foliage that is partly exposed at direct solar radiation: 75.43 % at $V_3$ and 69.72 % at $V_4$.

**2. Fertility of the vines.** The percent of fertile shoots for the experimental variants is not influenced by the bud load left on pruning, being comprised between 82 % at the first variant and 79% at third variant (table 2); in fact there is the shoot fertility resulted after the differentiation process from the previous year.

*Table 2*

**The influence of the bud load on the fertility characteristics of the vines at Pinot gris variety**

| Specification | Variant/Bud load | | | |
|---|---|---|---|---|
| | **$V_1$/16** | **$V_2$/22** | **$V_3$/28** | **$V_4$/36** |
| Fertility of shoots (%) | 82 | 78 | 79 | 80 |
| Relative fertility coefficient (Cfr) | 0.82 | 0.94 | 1.24 | 1.47 |
| Absolute fertility coefficient (Cfa) | 1.24 | 1.36 | 1.45 | 1.68 |

A different situation is registered regarding the fertility coefficients: the increase of bud load determine an increase of fertility coefficients: the highest values of fertility coefficients is registered at $V_4$ with Cfr = 1.47 and Cfa = 1.68; the lowest values are at $V_1$ with Cfr = 0.82 and Cfa = 1.24. The phenomenon is determined by the numerous shoots formed from dormant buds on $V_1$ variant. The lower bud load turn to advantage the fertility of this variety by forming many inflorescences on the shoots, because of the abundant resources catered by the foliage that assure a good sustenance of the vegetative and generative organs.

**3. Productivity of the vines.** Pinot Gris is a low productive variety due to the small grapes, especially when the vines are cultivated on the meager soils. The increase of bud load determine the decrease of the grapes' weight, as it follows: the weighty grapes with an average of 0.103 g are at $V_1$ experimental variant

while the smallest are at $V_4$ variant, with 0.078 g. The productivity of this grapevine variety is better valorized at a 16 bud load per wine ($V_1$) where upon the number of grapes per bud is 1.12; this value decrease at 1.09 grapes per bud at $V_2$ and 0.88 grapes per bud at $V_4$ (table 3). The best improvement of productivity is registered at the lower bud load of $V_1$ and $V_2$.

*Table 3*

**The influence of the bud load on the productivity of the vines at Pinot gris variety**

| Specification | Variant/Bud load | | | |
|---|---|---|---|---|
| | **$V_1$/16** | **$V_2$/22** | **$V_3$/28** | **$V_4$/36** |
| Number of grapes per vine | 18 | 24 | 29 | 32 |
| Number of grapes per bud | 1.12 | 1.09 | 1.01 | 0.88 |
| Weight of the grapes (g) | 0.103 | 0.097 | 0.90 | 0.078 |

**4. The quantity and the quality of the yield**. Productive potential of the Pinot Gris variety is low because of its small grapes; with the training system used in this wine-growing region (2.2 m/1.2 m; 3787 vines/ha; Cazenave Cordon), the yield varies between 5 and 13 t/ha. The bud load experimented determined a significant variation of the yield; the smallest yield, by 1.85 kg grapes/vine registered at $V_1$ and the weightiest of 2.61 kg/vine at a 28 buds/vine ($V_3$). The yield for one *ha* varies similarly with the yield on the vine: the biggest yield is registered at $V_3$ with a 9.86 t/ha and the lowest at $V_1$ with 7.0 t/ha.

*Table 4*

**The influence of the bud load on the quality and quantity of the yield at Pinot Gris variety**

| Specification | Variant/Bud load | | | |
|---|---|---|---|---|
| | **$V_1$/16** | **$V_2$/22** | **$V_3$/28** | **$V_4$/36** |
| Yield (kg/vine) | 1.85 | 2.32 | 2.61 | 2.49 |
| Yield (t/ha) | 7.0 | 8.76 | 9.86 | 9.41 |
| Sugar content, g/l | 194 | 222 | 188 | 182 |
| Acidity, g/l $H_2SO_4$ | 3.24 | 4.02 | 4.15 | 4.32 |

The quality of the yield was nearly under the biological qualitative potential of this variety, that can accumulate up to 230 sugar g/l. The best sugar content of the must is registered at $V_2$ variant with 222 g/l while the lowest at $V_4$ with 182 g/l. We can observe an negative correlation between the bud load and sugar accumulation, the biggest bud load determining the lowest sugar contents. Acidity of the must had the lowest level of 3.24 g/l $H_2SO_4$ at $V_1$, a very small acidity to assure the obtain of a fruity, balanced wine; the highest acidity, but not excessive registered at $V_4$ variant with 4.32 g/l $H_2SO_4$, while the $V_2$ and $V_3$ variants had balanced acidity of 4.02 g/l $H_2SO_4$ respectively 4.15 g/l $H_2SO_4$.

**5. Correlations between bud load, vegetative development and yield characteristics.** The bud load assure an increase of the yield but in the same time the quality of the grapes is significantly diminishing; the sugar content registering an important decrease, while the must acidity could became excessive in the rainy years.

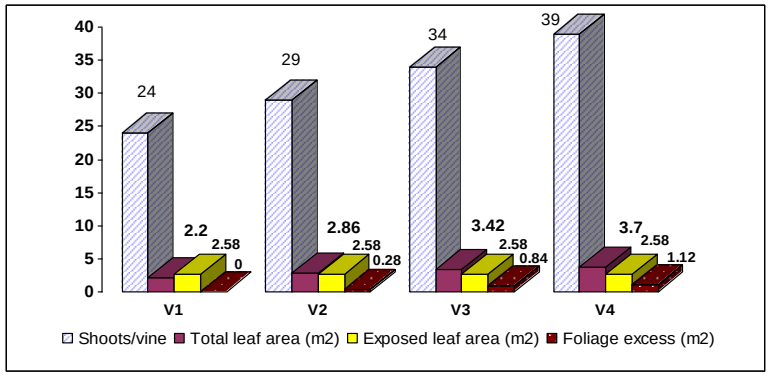


**Fig. 1.** The variation of number of shoots, total leaf area, exposed leaf area and foliage excess determined by bud load size, at Pinot Gris variety

The increase of bud load determines the increase of the number of shoots per vine and also an enlargement of the total leaf area; while the exposed leaf area maintains constant there results an augmentation of density of canopy because the training system doesn't permit the exposure of the entire foliage to direct solar radiation. This diminish the photosynthetic productivity of the foliage and the accumulation process of the glucides in shoots and berries. An approximate biological balance registers to $V_2$ variant which has an optimum leaf area, with an minimum foliage excess (figure 1).

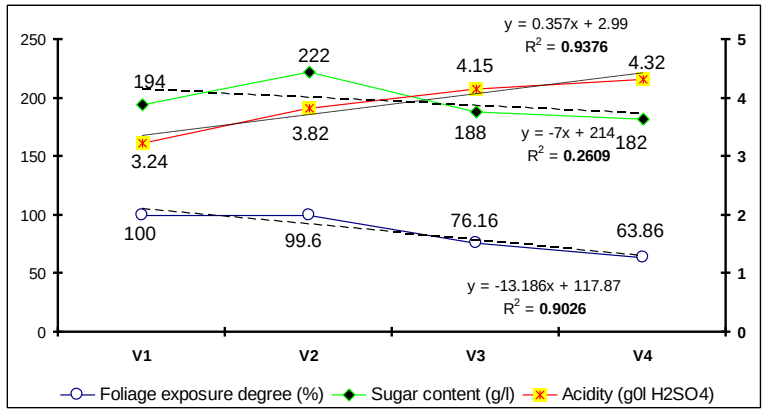


**Fig. 2**. Correlation between bud load, foliage exposure degree, sugar content and acidity at Pinot gris variety

Correlations between vegetative parameters and quality of the yield reveal an important influence of the foliage on the sugar accumulation and level acidity. The decrease of foliage exposure determines the diminution of sugar content and the increase of acidity (figure 2). The augmentation of the canopy denseness negatively correlates with sugar content (figure 3). From these correlations results that the bud load that assure an optimum valorization of qualitative potential of Pinot Gris variety in Copou wine-growing centre is 28 buds on the vine.

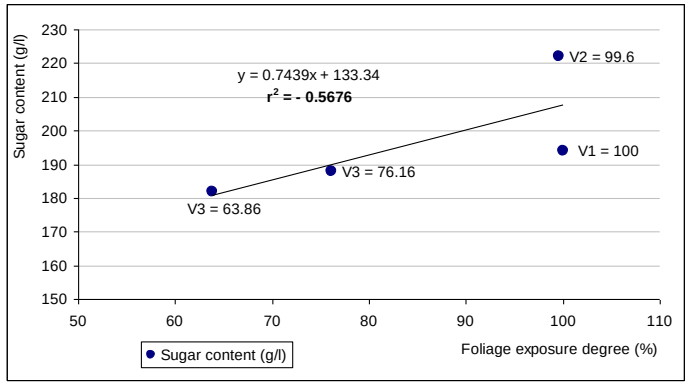


**Fig. 3.** Correlation between foliage exposure degree and sugar accumulation in the berries for Pinot Gris variety

This determine the development of a totally leaf area that can be entirely exposed to direct solar radiation and creates to leaves canopy an optimum microclimate conditions that stimulate the sugar accumulation and total acidity.

## CONCLUSIONS

1. In Copou wine-growing centre, Iasi vineyard, on Cordon Cazenave training system and 3787 vines/ha density of plantation, the biological vegetative equilibrium of Pinot Gris variety is achieved with a bud load of 22 winter buds per vine.

2. The optimum 22 winter buds/vine determine the development of 2.86 $m^2$ exposed leaf area that is rather entire exposed to direct solar radiation (90.2%) and assure an optimum microclimate for the grapes and leaves.

3. The highest yield by 9.86 t/ha is achieved with a 28 bud load/vine, but the sugar accumulations in this situation are very low, by 182 g/l; the optimum 22 bud load assures a 8.76 t/ha yield, that represent an average of biologic productivity potential for this variety.

4. The qualitative potential of Pinot Gris variety is turn to advantage with a 22 bud load/vine, that assure the highest sugar accumulation in the berries, respectively 222 g/l and a balanced total acidity of 4.02 g/l $H_2SO_4$.

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