

MONITORING THE STATE OF THE INSURANCE OF SOIL WITH THE MAIN TOTAL FORMS AND MOBILE NUTRIENTS UNDER THE INFLUENCE OF FERTILIZATION, IN THE CONDITIONS OF THE VINEYARD IAȘI

MONITORIZAREA STĂRII DE ASIGURARE A SOLURILOR CU PRINCIPALELE FORME TOTALE ȘI MOBILE DE ELEMENTE NUTRITIVE SUB INFLUENȚA FERTILIZĂRII, ÎN CONDIȚIILE PODGORIEI IAȘI

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***Abstract.** The problem of vineyards fertilization is especially complex because of the great amount of agents that interfere. Fertilization, in nowadays technical progress, must amplify and intensify the productive capacity of fertile vineyards in correspondance with the effort-effect-efficiency relation avoiding the risk of pollution of the crop or the environment. The influence of fertilization chemical on certain indicators of basic soil fertility (Nt, P-AL, K-AL), appears clearly in the conditions of experimentation and reflects the status of cultivation and fertility status of the soils with vocation wine. From this point of view, use of doses moderate fertilizers, administered especially in complex ternary (NPK), led in the study undertaken at the improving regime nutritional variety Aligote and respectively to a stabilization of its in the field of optimum on the entire range of vegetation analyzed.*

Key words: pollution, soil, fertilizer, protection, doses

***Rezumat.** Problema fertilizării în viticultură este una complexă datorată numeroșilor factori care interferează. Fertilizarea, în condițiile actualului progres, trebuie să amplifice și să intensifice capacitatea de producție a plantațiilor de vita de vie, în concordanță cu relația efort-efect-eficiența, evitând riscul de poluare a recoltelor și mediului. Influența fertilizării chimice asupra unor indicatori de bază ai fertilității solului (Nt, P-AL, K-AL) apare în mod evident în condiții de experimentare și reflectă starea de culturalizare și de fertilitate a solurilor cu vocație viticolă. Din acest punct de vedere, utilizarea dozelor moderate de fertilizanți, administrate mai ales în complex ternar (NPK), a condus în studiul întreprins la îmbunătățirea regimului nutrițional al soiului Aligote și respectiv la o stabilizare a acestuia în zona domeniului optim, pe întreg intervalul de vegetație analizat.*

Cuvinte cheie: poluare, sol, fertilizant, protecție, doze

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INTRODUCTION

The concept of “lasting agriculture “ is more and more promoted in agriculture practical, and the most important attribute of this system is the one which referes , to the soil and the environment quality in general. Mentaining and developing the quality of the soil, is an essential condition for the promotion of this kind of system, are workable through the increase of the energy and technology for upkeeping the soil. In this case, an essential role is maintaining and developing fertility of the soil by reducing the consumption of chemical fertilizer, consumer of energy.

An important source of pollution of the soil is consisted in irrational application of the fertilizer, wich big variety makes difficult in putting some templates of utilisation (Avarvarei, 1997). The effect of using the nitrate and phosphate in excess is known which has negative actions on microbiological flora from the soil, and leading to the accumulation into the vegetation of these elements, far beyond any tolerated limits (Borlan, 1994).

This study is made on these coordinations, the obtained results, being the foundation of data for practising in this area and a source of information for starting producers in the neighborhood (Volf, 2004).

MATERIAL AND METHOD

Knowing the agro-eco-pedological characteristics of the wine-growing center of Copou- Sorogari (Cotea, 2000) allowed to organize the experience like the influence of the mineral fertilization on the evolution of sourshing elements from the soil. Primary and secondary ecological factors of biotope in interaction are distinguishable, making the agrofitotechnic base of viticulture.

This study was developed during 3 years in the viticol center Copou-Sorogari, which was owned by the old S.C Podgoria S.A Copou lasi from administratively point of view. Now this lands are privately owened.

Acording to the geographic aspect, this lands are part of Jijia-Bahlui depression, beeing located in the south part of this depression. Under the geomorphological aspect, the studied territory is situated at the contact of two large subunits of the Moldavian Plateau: The moldavian Plain in north, and the Central Moldavian Plateau in south.The stratigraphy of the region is represented by the natural layers damaged by the rocks, on which are layers of sedimentary rocks of various ages; on the surface being deposited conglomerates of clay and marl interposed with fine sand.

The pedological study indicates the presence of chernozem (poorly levigated and decarbonated), clayey-argillaceous, developed on loessial deposits and not irrigated.

The chemical structure of these soils presents: pH(H₂O) 6.9 – 7.5, neutral reaction towards to poorly alkaline containing a medium concentration of loamy (2.4-2.5 % H) , a low to medium of nitrate concentration (1.9-3.9 mg NO₃⁻/100 g sol), a low concentration in mobile phosphorus (20.8-52.8 ppm P-AL); good gatering estate in mobile potassium (260-301 ppm K-AL).The content of 17.0 me % Ca²⁺, indicates an increased fertility. Among the changeable cations, the content of 2.06-2.88 me % Mg²⁺ situates the soil into a middle class fertility.The Boron is situated at the inferior limit of a

middle assurance (0.4-0.5 ppm B), the Copper at >25 ppm values indicates an excess soil catering, the movable zinc is at high quota: 1.8-2.0 ppm Zn.

There was studied the Aligote variety, widespread, spliced on the Berlandieri × Riparia Kober 5 BB as mother as, planting distances being of 2.20x1.10. There were applied monotonous cutting tasks of 17 eyes/m² (41 eyes/log) to the logs.

The undertaken study was concretized through the establishment of an experience with two factors A and B, the arranging method in the terrain being that of the subdivided holding, repeated 4 times. In the experimental machine, the graduation of the variable factors was:

The A Factor – the compost administered dosage (kg s.a./ha)

a₀ – unfertilized (Witness); a₁ – 0.5 dosage ; a₂ – 1.0 dosage ; a₃ – 1.5 dosage

The B Factor – the combination of fertilizing elements

b₀ – NPK – witness ; b₁ – N ; b₂ – P ; b₃ – K ; b₄ – NP ; b₅ – NK ; b₆ – PK

In the present study there were suggested three fertilization levels referring to the dosage and 7 levels of utilization of the combination of fertilizing elements.

The following levels were established, taking into account the expended crop and the productivity soil estate:

- the 0.5 dosage level with : 50 kg/ha s.a N ; 25 kg/ha s.a P₂O₅ ; 90 kg/ha s.a K₂O
- the 1 dosage level with ; 100 kg/ha s.a N ; 50 kg/ha s.a P₂O₅ ; 180 kg/ha s.a K₂O
- the 1.5 dosage level with : 150 kg/ha s.a N ; 75 kg/ha s.a P₂O₅ ; 270 kg/ha s.a K₂O

This is how 7 fertilization levels resulted: exclusive fertilization with nitrogen (N); exclusive fertilization with phosphorus (P); exclusive fertilization with potassium (K); binary fertilization with nitrogen + phosphorus (NP); binary fertilization with nitrogen + potassium (NK); binary fertilization with phosphorus + potassium (PK); ternary fertilization with nitrogen + phosphorus + potassium (NPK).

As a range of chemical compost were used simple chemical compost for facilitating the dosage and reports calculus and also for the general economicity of other advantages. In this context was used the ammonium nitrogen, NH₄NO₃ as a nitrogen nutrition source, with 34.5% s.a., as phosphorus source was proposed the utilization of *concentrated superphosphate* Ca(H₂PO₄)₂ · H₂O, with 50% s.a. The potassium was administered as potassium salt 50%. The organical fertilization was assured by using the stable dirt 40t/ha.

Annually, during 3 vegetation moments : unbudging, booming and grapes maturing, there are taken soil samples on 2 depths 0-20 and 20-40 cm, from each variant, in order to determine the primary bidding major elements dynamics.

The analysis methods and techniques for the soil samples were the following:

- the P-AL și K-AL content, the Egner-Riehm-Domingo method, colorimetric dosage;

- the total nitrogen content - the Kjeldahl method.

RESULTS AND DISCUSSIONS

The results obtained by compost administrating in dosages and different combinations, dignify the improval of nitrogen regime within soil (fig.1).

At unbuding the minimal dosages, no matter, the combination of fertilizing element, there are no statistically assured results after the first fertilization year, ever if the the nitrogen containt increases progressively with them .Only during the second year of research there is assured a soil content of 0.267% N_t during unmuding in the 165 kg/ha s.a variant, bigger than the average of the years, statistically unasured.

During booming, the 165 kg/ha s.a. NPK variant concurs at a normal soil suply with this element, situating at 0.246% N_t annual average, with a difference from the unfertilized witness of + 0.033%.The 330kg/ha s.a. NPK (1 dosage) and 495 kg/ha s.a. NPK (1.5 dosages) leads to a soil catering beyond the normal limits – luxury consumption .

During grape maturation, annual average, minimum dosages, at N, NK, NP combinations they dignify as statistically assured; the minimum dosage and the ternary combination, 165 kg/ha s.a. NPK, strenghtens the motivation of application in complex fertilizad elements, the total nitrogen being situated at 0.233% N_t .

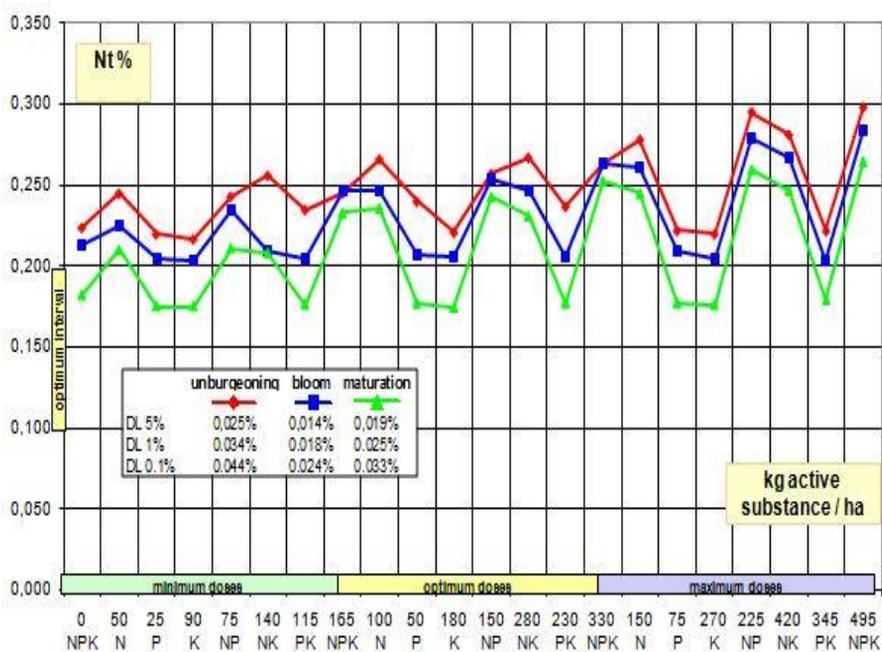


Fig. 1 The influence of fertilizers combination x measure interaction towards the evolution of total nitrogen (Nt %) in soil at Aligote in 3 phenological phases: unburgeonig, bloom, maturation of grapes

Analyzing the phosphorus ensurance estate (fig. 2), accesible fraction, after aplying dosages fertilization and different compost combinations, during the whole vegetation period, we ascertain that they were improved.

In the unbuding phenophase, there is a obvious tendency of improving of the phosphatic nutritional diet, from one year to another, at every single level of fertilization (0.5 dosage, 1 dosage and 1.5 dosage and especially at the P, NP, PK and NPK combinations) .The minimum dosage variant 165 kgs.a./ha NPK ensures the soil with a 116.0 ppm content P-AL on annual average (statistically assured – very semnificative) comparable to 117.1 ppm P-AL for the 330 variant kg/fa s.a NPK and 119 ppm P-AL for the 495 kg/ha s.a NPK.

In the booming phenophase, although the values decrease from the previous phenophase, because of the vine consumption, they have an optimum phosphatic activity of the soil.The minimum dosages ensure the soil on the annual average 100.9 ppm P-AL (165 kg/ha s.a NPK variant – very significant).

At grapes maturation, the obtained results on the annual average, prove the efficacy of the progresseive application of dosages and binary but especially ternary combinations, of nutrient elements .The 165 kg/ha s.a. NPK variant ensures the soil with a content of 96.5 ppm P-AL, very significant ensurance, considered to be a medium phosphorus gatering of the soil (> 71 ppm P-AL).

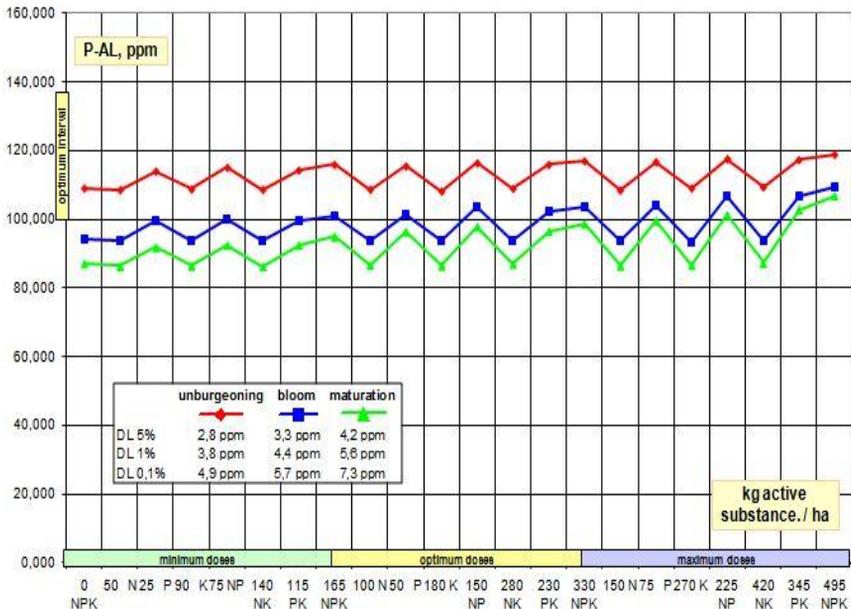


Fig. 2 The influence of fertilizers combination x measure interaction towards phosphorus mobile forms' evolution (P-AL, ppm) in soil at Aligote in 3 phenological phases: unburgeoning, bloom, maturation of grapes

In the phenophase of unbudging, there are being assured normal levels (optimal) of accessible K in soil by utilizing the minimal dosage. The 90 kg s.a/ha K, 140 kg s.a/ha NK, 115 kg s.a/ha PK și 165 kg s.a/ha NPK variants ensures the soil in 373.1 ppm, 374.2 ppm, 373.3 ppm and 374.7 ppm K-AL contents. The last one is being ensured distinctively significant.

In the blossom moment the result for those 3 years of study regarding the fertilization impact for the evolution of accessible K, show that the administration of the fertilizers in increased dosages and in singular combinations, binary and ternary ensures an improvement of the K nutritional regim. The 140 kg s.a/ha NK and 165 kg s.a/ha NPK variant (minimal dosages) ensures to the soil 360.8 ppm K-AL, respectively 361.4 ppm K-AL very good in significance.

The results are showing that in maturation phenophase of the grapes, in soil, of all the years, it is satisfied the optimal level of providing the soil with accessible K, statistically assured significantly (ecological dosages), distinct significant (optimal dosages) and very significant (maximal dosages) (fig. 3)

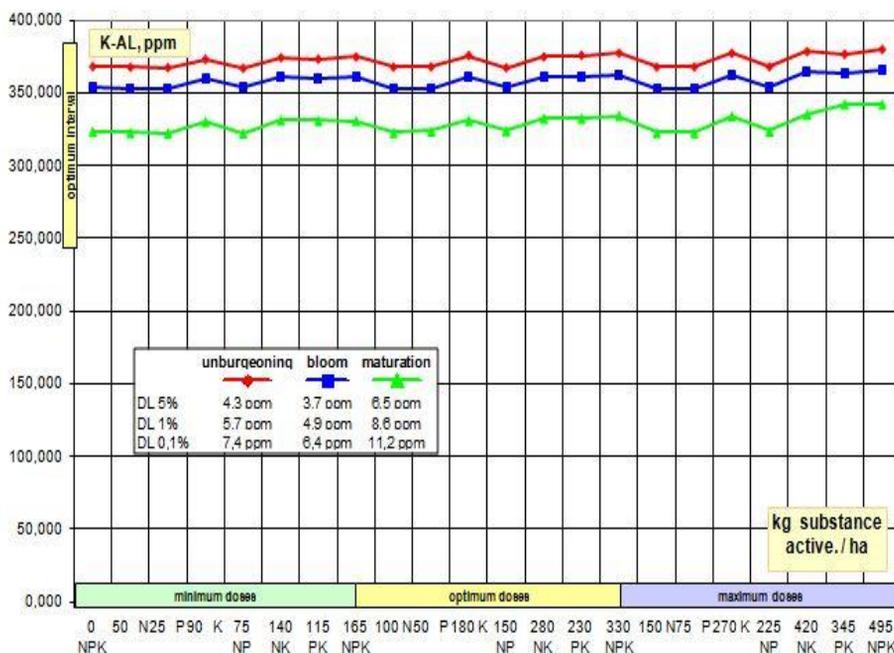


Fig. 3 The influence of fertilizers combination x measure interaction towards potassium mobile forms' evolution (K-AL, ppm) in soil at Aligote in 3 phenological phases: unbudging, bloom, maturation of grapes

CONCLUSIONS

- ❖ Chemical fertilization of the soil in viticulture, broached in minimal usage of fertilizers, avoids the environmental pollution danger and assures the agronomical, economical and entropical efficiency.

- ❖ The statistical parameters of the total N content from the superior horizon of the soils with viticulture utilization, chemical fertilized, show a quite restrained interval of content, variable in rapport with the utilized compost and the nature of the fertilized element.
- Assingation of minimal dosages unilateral distributed (N), in binary complex (NP, NK) and in tertiary complex (NPK) has led, in all 3 phenophases, at accumulating N sleightly overoptimal, ensured statistically at different levels and comparable.
- The 165 NPK variant correlates with a total N content within 0.245% at unbud and 0.233% at maturation. The two times or three times increasing in compost dosages had favored N accumulations in soil much over the optimal limits, wich may induce the manifestation of some nutritional imbalance.
- The 330 NPK and 495 NPK variants achieve accumulations in the soil within 0.263% (unburgeonig) and 0.253% (maturation) and 0.298% and 0.265%, for the same interval of vegetation.

- ❖ The variant analysis showed a cumulative effect in the interaction of the 2 singular factors considered in the study (dosage x combination of fertilized elements) on the evolution of the phosphate fertility of soils.
- The annual chemical fertilization with N, P and K in minimal quantities (the 165 NPK variant) had determine an improving of the mobile forms of P in soil, assuring a medium to optimal supply: 116.0 ppm P-AL (unburgeonig)), 100.8 ppm P-AL (bloom) respectiv 95.1 ppm P-AL (maturation) very significant.
- The doubling and tripling of the fertilizers dosages in NPK relationship, does not enrich the soil with mobile phosphates spectacularly, the differences between the utilization of the minimal dosages are insignificant and relatively pumpy.

- ❖ The interaction between the dosage factors x fertilizing element combination was good for the evolution of the potassium nutritional diet of the soil, put across different ensurance optimum estates especially at the fertilization in minimum dosages.
- At the level of utilization of minimum fertilizers dosages detanches the 165 NPK variant which realizes in soil values statistically ensured for “accessible K”: 374.7ppm K-AL at unbuding, 361.4 ppm K-AL at booming and 330.9 ppm K-AL at maturation, comparable to the values obtained by using the optimum dosages, the 330 NPK variant.

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