



«Σχολή Θετικών Επιστημών και Τεχνολογίας»
«Μεταπτυχιακό Πρόγραμμα Σπουδών: Διαχείριση και
Τεχνολογία Ποιότητας»

Διπλωματική Εργασία

Μελέτη των Ποιοτικών Χαρακτηριστικών του Γλεύκους Λευκών
Ποικιλιών Σταφυλίου από διάφορες γεωγραφικές περιοχές.

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Περίληψη

Η αμπελοκαλλιέργεια και η οινοπαραγωγή αποτελούν σημαντικούς πυλώνες του αγροδιατροφικού τομέα της Ελλάδας, με ιδιαίτερη οικονομική, πολιτιστική και ιστορική αξία. Η ποιότητα του γλεύκους, η οποία επηρεάζει καθοριστικά τα χαρακτηριστικά του παραγόμενου οίνου, διαμορφώνεται από ένα σύνθετο πλέγμα παραγόντων που περιλαμβάνει τις εδαφικές και κλιματικές συνθήκες, τη γεωγραφική προέλευση, την ποικιλία της αμπέλου και το στάδιο ωρίμανσης των σταφυλιών. Η κατανόηση των παραγόντων αυτών καθίσταται ιδιαίτερα σημαντική υπό το πρίσμα των σύγχρονων προκλήσεων που επιφέρει η κλιματική αλλαγή στην αμπελουργική παραγωγή.

Η παρούσα διπλωματική εργασία εξετάζει τα ποιοτικά χαρακτηριστικά του γλεύκους λευκών ποικιλιών σταφυλιού (Ασύρτικο, Μαλαγουζιά, Chardonnay και Sauvignon Blanc) από διαφορετικές γεωγραφικών περιφέρειες της Ελλάδας (Δυτική Μακεδονία, Κεντρική Μακεδονία, Στερεά Ελλάδα, Ανατολική Μακεδονία και Θράκη). κατά την περίοδο 2015 - 2025, με στόχο την κατανόηση των μηχανισμών και την ανάδειξη των σημαντικότερων παραγόντων που επηρεάζουν τη σύσταση και την τεχνολογική ωριμότητα του γλεύκους και τη δημιουργία μοντέλων ποιότητας.

Η ανάλυση βασίστηκε σε 1.211 δείγματα γλεύκους, για τα οποία εξετάστηκαν βασικές φυσικοχημικές παράμετροι, όπως ο δυναμικός αλκοολικός τίτλος, η πυκνότητα, τα σάκχαρα, η ολική και ενεργός οξύτητα, το τρυγικό και μηλικό οξύ και το κάλιο. Παράλληλα, αξιοποιήθηκαν η ημερομηνία του τρύγου και κλιματικά δεδομένα που αφορούσαν τη μέση, ελάχιστη και μέγιστη θερμοκρασία καθώς και τη συνολική βροχόπτωση από μηνιαίες εκθέσεις για το χρονικό διάστημα από τον περκασμό έως την πλήρη ωρίμανση των σταφυλιών.

Τα αποτελέσματα της στατιστικής ανάλυσης ανέδειξαν σημαντική μεταβλητότητα στα ποιοτικά χαρακτηριστικά του γλεύκους μεταξύ ετών, γεωγραφικών περιφερειών και ποικιλιών. Επίσης παρατηρήθηκαν ισχυρές συσχετίσεις μεταξύ βασικών δεικτών ποιότητας, ιδιαίτερα μεταξύ σακχάρων, πυκνότητας και δυναμικού αλκοολικού τίτλου, καθώς και μεταξύ των παραμέτρων που σχετίζονται με την οξύτητα. Η Ανάλυση Κύριων Συνιστωσών (PCA) οδήγησε στην ανάδειξη τριών κύριων συνιστωσών, οι οποίες περιγράφουν τους βασικούς άξονες μεταβλητότητας των ποιοτικών χαρακτηριστικών του γλεύκους. Επιπλέον, διαπιστώθηκαν στατιστικά σημαντικές διαφορές μεταξύ ετών, γεωγραφικών περιφερειών και ποικιλιών, με τις σημαντικές διαφοροποιήσεις να

εντοπίζονται σε συγκεκριμένες ομάδες, επιβεβαιώνοντας τη συμβολή των παραγόντων αυτών στη διαμόρφωση της ποιότητας του γλεύκους. Τα μοντέλα πολλαπλής γραμμικής παλινδρόμησης ανέδειξαν ως σημαντικούς προσδιοριστικούς παράγοντες της ποιότητας του γλεύκους την ελάχιστη θερμοκρασία, το έτος, τη γεωγραφική περιφέρεια και την ποικιλία.

Συμπερασματικά, η εργασία επιβεβαιώνει ότι οι κλιματικοί, γεωγραφικοί και ποικιλιακοί παράγοντες επηρεάζουν καθοριστικά τη χημική σύσταση και την ποιότητα του γλεύκους. Παράλληλα, αναδεικνύει τη χρησιμότητα πολυμεταβλητών στατιστικών τεχνικών, όπως η Ανάλυση Κύριων Συνιστωσών και τα μοντέλα παλινδρόμησης, για την κατανόηση των μηχανισμών που διαμορφώνουν την ποιότητα του γλεύκους και για την ανάπτυξη εργαλείων υποστήριξης αποφάσεων στον αμπελοοινικό τομέα.

Λέξεις – Κλειδιά

γλεύκος, ποιοτικά χαρακτηριστικά, λευκό σταφύλι, κλιματικές συνθήκες, PCA, τεχνολογική ωρίμανση, παλινδρόμηση

Comparative Study of the Quality Characteristics of Must from White Grape Varieties in Different Geographical Areas.

Abstract

Viticulture and wine production constitute important pillars of the Greek agri-food sector, holding significant economic, cultural, and historical value. Grape must quality, which largely determines the characteristics of the resulting wine, is shaped by a complex interaction of factors, including soil and climatic conditions, geographical origin, grape variety, and the stage of grape ripening. Understanding the influence of these factors has become increasingly important in light of the challenges posed by climate change to viticultural production.

The present thesis investigates the quality characteristics of must obtained from four white grape varieties (Assyrtiko, Malagousia, Chardonnay, and Sauvignon Blanc) cultivated in five geographical regions of Greece (Western Macedonia, Central Macedonia, Central Greece, Eastern Macedonia, and Thrace) during the period 2015–2025. The main objective of the study is to identify the factors affecting must composition and technological maturity, as well as to develop statistical models for the assessment and prediction of must quality.

The analysis was based on 1,211 grape must samples. Key physicochemical parameters were examined, including potential alcohol content, density, sugars, total and active acidity, tartaric acid, malic acid, and potassium concentration. In addition, harvest date and climatic data, including average minimum and maximum temperature as well as total rainfall, obtained from monthly reports covering the period from veraison to full grape maturity, were evaluated.

The statistical analysis revealed considerable variability in must quality characteristics across years, geographical regions, and grape varieties. Strong correlations were observed among key quality indicators, particularly between sugar content, density, and potential alcohol content, as well as among variables related to acidity. Principal Component Analysis (PCA) identified three principal components that described the main sources of variability in must quality characteristics. Furthermore, statistically significant differences were detected among years, regions, and varieties, with statistically significant differences being

identified between specific pairs of groups, confirming the contribution of these factors to the determination of must quality.

Multiple linear regression models identified minimum temperature, year, geographical region, and grape variety as significant determinants of must quality.

Overall, the findings confirm that climatic, geographical, and varietal factors play a crucial role in shaping the chemical composition and quality of grape must. In addition, the study highlights the value of multivariate statistical techniques, such as Principal Component Analysis and regression modeling, for understanding the mechanisms underlying must quality and for developing decision-support tools for the viticulture and wine industry.

Keywords

grape must, quality characteristics, white grape, climatic conditions, PCA, technological maturity, regression.

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