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COMPARATIVE STUDIES ON SOME TRAINING SYSTEMS FOR THOMPSON SEEDLESS GRAPE CULTIVAR UNDER NOUBARIA AREA CONDITIONS

Girgis, V.H., El-Shenawy, S.I., M.A. and Ghada Sh. Sh.
Viticulture Dept., Hort. Res. Instit., Agric. Res. Center, Giza, Egypt

ABSTRACT

This study was carried out to investigate the impact of some training systems on bud behaviour, vegetative growth, yield and fruit quality of Thompson Seedless grapevines. Seven training systems were applied: Head, Cordon Rowaia, Lenz Mozer, Umbrella, Traditional, Double T and Y shape systems.

The results showed that both Y shape and Double T training systems were effective in increasing percentage of bud burst and bud fertility coefficient, average number of clusters/vine, average cluster weight, yield/vine and improving physical and chemical characteristics of clusters and berries. Positive effects were achieved concerning dynamics of wood ripening, morphological characteristics of vegetative growth in comparison with the other training systems. On the other hand, Cordon Rowaia training system was found to record the minimal values of these characters.

INTRODUCTION

Proper training of grapevines is essential to maintain plant size, shape, and productivity. A vine training system is a sustainable growth form of a vine. This distinguishes it from the engineering involved in the construction of a vineyard trellis which will be used to support that growth form and from pruning, which is the actual task of creating and maintaining that growth form. A vine training system begins with a conceptualized ideal form or shape of a vine.

The type of trellis-training system is known to have large effects on shoot growth, fruit composition and, crop yields of grapevines (Shaulis 1980; Smart *et al*. 1985; Smart & Smith 1988; Kliewer *et al.* 1988; Reynolds & Wardle 1994 and Abd El-Ghany & Marwad 2001). The shape of a trellis system for grapevines should support and spread longer shoots, which are more exposed to the sun. Sun light is the environmental factor that is most frequently not fully utilized by grape growers to maximize, crop yields. By manipulating vine width and height through trellis training systems, growers can greatly increase the total amount of light intercepted by foliage per unit area of the vineyard and thereby increase photosynthetic capacity. High light intensity is required for maximum photosynthesis (Kliewer 1973).

Bud differentiation, fruit ripening and wood maturation are thus closely related to seasonal management operations such as shoot positioning (Smart, 1985).

The purpose of this investigation was to disclose the impact of seven different training systems: Head, Cordon Rowaia, Lenz Mozer, Umbrella, Traditional, Double T and Y shape on bud behaviour, vegetative growth, yield/vine and fruit quality of Thompson Seedless grapevines.

MATERIAL AND METHODS

This investigation was conducted in the vineyard situated at the Noubaria Research Station, Beheira Governorate on mature Thompson Seedless grapevines. The study extended for two successive seasons (2002 and 2003). The vines were 12-year-old, grown in a sandy soil, spaced at 1.75 X 2.5 meters apart and irrigated by the drip irrigation system, The vines were pruned during the first week of January so as to leave 72 buds/vine. Eighty four uniform vines were chosen. Each four vines acted as a replicate and each three replicates were trained by one of the following systems: Head, Cordon Rowaia, Lenz Mozer, Umbrella, Traditional, Double T and Y shape (Figure 1).

The following parameters were adopted to evaluate the tested training systems:-

1. Bud behaviour

Number of bursted out buds/vine was recorded, and then the percentage was calculated by dividing number of bursted buds per vine by the total number of buds per vine left at pruning. Coefficient of bud fertility was calculated by dividing average number of bunches per vine by the total number of buds/vine according to Huglin (1958) and Bessis (1960).

2. Yield and physical characteristics of clusters

Yield/vine (kg) was determined by multiplying the total number of clusters/vine by average cluster weight (g).

Representative random samples of six clusters/vine were harvested at maturity when TSS reached about 16-17% according to Tourky *et al*., (1995). The following characteristics were determined: average cluster weight (g), average weight of berries/cluster (g), cluster width and length (cm), number of berries per cluster and coefficient of cluster compactness.

3. Physical and chemical characteristics of berries:

Average berry weight (g) and berry size (cm^3). Total soluble solids in berry juice (TSS) (%) was determined by a hand refractometer and total titratable acidity as tartaric acid (%) (A.O.A.C. 1985). Hence TSS /acid ratio was calculated.

4-Vegetative growth and wood ripening

At growth cessation, the following morphological and chemical determinations were carried out on 4 shoots / the considered vine:

1- Average shoot length (cm).
2- Average number of leaves/shoot.
3- Average leaf area (cm^2) of the apical 5^{th} and 6^{th} leaves using a planimeter.
4-Total leaf area/vine (m^2) was determined by multiplying average number of leaves/shoot by average leaf area by the number of shoots/vine.
5-Coefficient of wood ripening was calculated by dividing length of the ripened part by the total length of the shoot according to Bouard (1966).

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5- Statistical analysis:

The complete randomized block design was adopted for this experiment. The statistical analysis of the present data was carried out according to Snedecor & Chocran (1972). Averages were compared using the new L.S.D. values at 5% level. Percentages were transformed by the equation prior to the statistical analysis and thereafter percentages were presented with statistical letters.

RESULTS AND DISCUSSION

1. Bud behaviour

*** Percentage bursted Buds:-**

Data presented in Table (1) indicated that bud burst percentages increased in Y shape and Double T training systems as compared with the other training systems. However, Cordon Rowaia training system recorded the lowest percentage of bud burst.

*Coefficient of bud fertility-:

The effect of training systems on this parameter was found to go parallel with bud burst (%) which was appreciably increased as a result of the increase of bud burst (%).

These results agree with those found by (Orth & Chambers 1994, Smart, 1985 and Abd El-Ghany & Marwad 2001). They found that T and Y shapes increased bud fertility in some grape cultivars.

2. Yield/vine and physical characteristics of clusters

Data of both seasons (Table 2&3) showed a significant increase in the yield per vine, number of clusters per vine (as a result of the increase in bud fertility), average cluster weight, cluster dimensions i.e. length and width and number of berries/cluster with Y shape and Double T training systems as compared to Cordon Rowaia system. This increment was significant in both seasons of this study.

The effect of training systems on coefficient of cluster compactness was statistically insignificant.

These results can be interpreted in view of he fact that cluster of vines of Y shape and double tee training systems had good light penetration through canopy in comparison with Cordon Rowaia and Head training systems.

From the previously mentioned results, it can be concluded that the effect of Y shape and Double T training systems on increasing the yield per vine was gained as a result of its effect on increasing both number of clusters/vine and average cluster weight through increasing both bud burst (%) and bud fertility coefficient. The results in this connection are in agreement with those obtained by (Smart, 1985 and Abd El-Ghany & Marwad 2001), they stated that T and Y shapes caused an obvious increase in the yield and improvement of cluster physical characteristics of some grape cultivars.

3. Physical and chemical characteristics of berries:

Variable effects attributed to different training systems were evident on berry weight and size (Table, 4). Y shape and Double T training systems significantly increased these parameters as compared with the cordon Rowaia training system.

The increment in cluster and berry weight in Y shape and double T training systems could be ascribed to the parallel increment observed in the leaf area the result of which photosynthesis activity of the leaves was increased.

With regard to the chemical characteristics of berries, Y shape and Double T training systems markedly increased juice TSS and TSS/acid ratio and reduced acidity as compared with the Cordon Rowaia training system.

The results in this respect are in harmony with those obtained by (Orth and Chambers 1994 and Abd El-Ghany & Marwad 2001). They found that T and Y shapes improved fruit quality.

4-Vegetative growth and wood ripening

The data concerning vegetative growth (Table 5) indicated that type of training system had a significant effect on parameters of vine vigor; shoot length, number of leaves and leaf area. Y shape and Double T training systems were shoot to increase significantly these parameters as compared with the cordon Rowaia training system. These results may be attributed to that Y shape and Double T training systems allowed vine foliage to more exposure to sunlight as a result of the favorable orientation of shoots in these training systems. These results are in harmony with those obtained by (Orth & Chambers 1994 and Abd El-Ghany & Marwad 2001); the later noticed that open espalier-type system was more suitable for mechanized canopy management.

Coefficient of wood ripening was significantly increased with Y shape and Double T training systems as compared to the Cordon Rowaia system. This may be due to the increased photosynthetic capacity (Kliewer. 1973). These results are in accordance with (Abd El-Ghany & Marwad 2001).

Data illustrated in (Figure 2 & 3) indicate that there was a highly positive correlation between total leaf area and cluster weight and between total leaf area and yield/vine in both seasons of this investigation.

Generally, the best training systems were Y shape and Double T, where good distribution of the growing shoots was ensured. Also they gave optimum high sunlight capture and adequate cluster exposure for achieving better fruit quality. Both Y shape and Double T training systems were associated with a considerably higher percentage of vine canopy. These tend to spread shoots so that the leaves were unlikely to shade each other (Weaver & Kasimatis. 1975).

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دراسات مقارنة على بعض نظم التربية فى العنب صنف الطومسون سيدلس تحت ظروف منطقة النوبارية

فيكتور حبيب جرجس ، صلاح إبراهيم الشناوى ، غادة شكر شاكر

قسم العنب – معهد بحوث البساتين – مركز البحوث الزراعية بالجيزة - مصر

أجرى هذا البحث لدراسة تأثير بعض نظم التربية على سلوك العيون والنمو الخضرى والمحصول وجودة الثمار لكرمات عنب الطومسون سيدلس. وقد تم إختيار سبعة نظم تربية وهى التربية الرأسية، كردون روايا ، لنز موزار، أمبريلا، التربية القصبية التقليدية ، نظام التربية T المزدوج، نظام التربية شكل Y.

وقد أشارت نتائج الدراسة إلى أن نظامى التربية شكل Y، T المزدوج كانت فعالة فى زيادة النسبة المئوية لتفتح البراعم ومعامل خصوبة البراعم وعدد العناقيد/كرمة ومتوسط وزن العنقود والمحصول كما أدت إلى تحسين الصفات الطبيعية والكيماوية للعناقيد والحبات ودرجة نضج الخشب بالاضافة إلى تحسين الصفات الخضرية للمجموع الخضرى مقارنة بباقى نظم التربية، ومن ناحية أخرى سجل نظام التربية كردون روايا أقل القيم لهذه الصفات.