EFFECT OF TIPPING AND FOLIAR APPLICATION OF PROLINE AND BOTMINN PLUS ON VEGETATIVE GROWTH AND LEAVES MINERALS CONTENT OF GRAPEVINE

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ABSTRACT
This study was conducted during 2022 in a private vineyard located in Chwarta town northeastern Sulaymaniyah, Kurdistan Region-Iraq, the vineyard was rain-fed cultivation. This research was aimed to investigate the effect of tipping, foliar application of proline (0, 100, and 200 mg.L^{-1}), botminn plus (0, 3, and 6 ml.L^{-1}) and their interaction on vegetative growth parameters, and some leave mineral content. The results showed practicing grapevine's shoot tipping significantly increased single leaf areas, leaf's chlorophyll content, lateral shoot number, N, P, and K%, except proline content. The foliar application of proline especially at (200 mg.L^{-1}) significantly increased all study characteristics, spraying botminn plus especially at 6 ml.L^{-1}gave the highest value of all study parameters. The triple interaction between tipping, proline, and botminn plus greatly enhanced all traits since tipped vine + 200 mg.L^{-1} proline + 6 ml.L^{-1} botminn plus significantly outshine in leaf area, number of lateral shoots, proline content, and N% in leave petiole, whereas the interaction of non-tipped vine + 200 mg.L^{-1} proline + 6 ml.L^{-1} botminn plus significantly increased chlorophyll content.

Keywords: vineyard, organic fertilizer, *Vitis vinifera*, canopy.
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تاثير قرط القمة النامية والرش الورقي بالبرولين وبوتمين بلس في صفات النمو الخضري والمحتوى المعدني لاوراق العنب

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المستخلص
أجريت الدراسة في مزرعة عنب ديمية خاصة تقع في بلدة جوارتا شمال شرق السليمانية ، إقليم كوردستان العراق. تم إجراء البحث لمعرفة تأثير قرط القمة النامية والرش الورقي بالبرولين (0 ، 100 ، 200 ملغم.لتر$^{-1}$) والبوتمين بلس (0 ، 3 ، 6 مل.لتر$^{-1}$) والتداخل بينهم على صفات النمو الخضري والمحتوى المعدني لكرمات العنب (*Vitisvinifera* L.)، صنف خوشناو ، خلال موسم النمو 2022. أظهرت النتائج أن ممارسة قرط القمة النامية أدى إلى زيادة كبيرة في مساحات الورقة المفردة ، ومحتوى الكلوروفيل في اعناق الأوراق ، وعدد الفروع الجانبية ، و N ، و P ، وK ٪ ، باستثناء محتوى البرولين. وأدى الرش الورقي للبرولين خاصة عند (200 ملغم.لتر$^{-1}$) إلى زيادة معنوية في جميع الصفات المدروسة ، رش البوتمين بتركيز 6 مل.لتر$^{-1}$ بشكل خاص أعطى أعلى قيمة لمعظم الصفات المدروسة. عزز التداخل الثلاثي بين قرط القمة والبرولين والبوتمين تشجيع جميع الصفات المدروسة بشكل كبير حيث ان قرط القمة + الرش بالبرولين بتركيز 200 ملغ.لتر$^{-1}$ + 6 مل.لتر$^{-1}$بوتمين بلس زادت معنويا صفات مساحة الوقة وعددالافروع الجانبية ومحتوى البرولين وN ٪ في سويقات الأوراق.

الكلمات الافتتاحية:مزرعة عنب،سماد عضوي، *Vitis vinnfera* ظلة.
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INTRODUCTION

Grape (*Vitis vinifera* L.) is considered one of the most remarkable and popular fruit crops globally (2) for its exceptional flavor, sweet taste, and high nutrient value (4, 26), the distinctive chemical components of grapes are a source of beneficial medicines for many diseases (26). The photochemistry of grape is rich in a wide range of compounds like water, proteins, lipids, carbohydrates, vitamins, minerals also fiber, vitamin C, and phenolic compounds, which made it a valuable fruit with much useful health for humans (3, 23, 27). The most critical uses of grapevine fruit are to manufacture juices, beverages, and wines; also it can be used as table grapes and dried fruit. Grape considers a versatile fruit and economically important, which made it typically distributed vastly (8, 19, 26). Grapevines are growth normally in tropics or subtropics and temperate zones, and nearly it grows in 90 countries (5). The area which is planted by grapevines is 6.9 million hectares, so the grape production is about 77.1 million tons globally (11, 15). Canopy management critically affects the grapevine's quality and production, by preserving and amplifying the grapevine growth, and its role appears properly according to the grapevine's vigorousness, temperature, daylight, and moisture of the vineyard region (22, 4) Tipping is cutting nearly 6-8 cm of the growing shoot's tip (25). In general, tipping's theme is to obtain a sufficient ratio of leaf area to crop level (16). Excellent tipping of grapevine shoots can be done through proper timing and the amount of growth to be removed, by this practice; photosynthetic products refer downwards, to the lower buds of the tipped shoot. Summer shoots that appear and grow throughout active growth will provide additional photosynthesis because by growing these lateral shoots there will be more leaves with a high leaves surface area and produce carbohydrates known as great carbohydrate sources (209). Practicing shoot tipping in mid-sized grapevines led to lateral shoot growth and an increasing number of leaves on shoots, this shoot shortening improves accumulation of sugar in the fruit also starch accumulation in other parts of the vine (12). Applying amino acids or their precursors or derivatives to plants is a widely used method aimed at promoting plant development and increasing crop production (18, 28). Proline is unique amino acid. It is strong non-enzymatic antioxidant; it stimulates the plant's resistance through membrane and protein stabilization, free radical scavenging, and gene expression modulation (24). Exogenous proline application works as an additional source of nitrogen (N) that is required for survival and growing the plant under stress (27). Organic fertilizers are highly recommended these days instead of chemical fertilizers because natural fertilizers are more powerful and improve plant growth, and increase the nutritional status of plant, while mineral fertilizers are costly and have a harmful effect (7, 1, 18, 19, 28). Consequently; this study is planned to: Investigate the response of the grapevines to the tipping practice, which it conceded as a powerful agriculture practice. Since the vines are growing under rain-fed conditions, we applied a spray of proline to know its effect on the vegetative growth and leaves mineral content, characteristics of the grapevine by increasing the resistance to dried and hot weather, Also to evaluate effect of botminn plus as liquid organic fertilizer on vegetative growth and leaves mineral content, characteristics of the grapevine.

MATERIALS AND METHODS

An experiment was conducted at a rain-fed vineyard located near Chwarta town, 974 m above sea level and 35 km north-eastern of the Sulaymaniyah governorate in the Kurdistan region-Iraq, during the growing season of 2022. Twenty-one-year-old grapevines were used, and the vine spacing was 3*2.5 m. The study was conducted to investigate the effect of tipping (tipping and without tipping), foliar application of proline with three concentrations of (0, 100, and 200 $mg.L^{-1}$), foliar application of botminn plus with three concentrations (0, 3 and 6 $ml.L^{-1}$) and their interaction on vegetative growth and some mineral leaf-petiole content of grapevine cv. Khoshnaw. So, this experiment included three treatments, the first one was tipping which was conducted once per season 10 days after full bloom, and the other two factors had the foliar application of proline and Botminn plus, both

of them sprayed twice per season, first two weeks before full bloom, second two weeks after berry set. Therefore, the experiment consisted of 18 treatments with three replications, with one individual vine for each experimental unit, and applied as a factorial experiment using (RCBD) design. So the numbers of vines used were 54 vines. A detergent powder as a wetting agent at (1-2 $g.L^{-1}$) was added to all the spraying solutions including 0.0% proline and botminn plus (control). The vines were sprayed with proline and botminn plus solutions till runoff ($2L.vine^{-1}$). Horticultural practices except for tipping and adding proline and botminn plus were used as usual. Potential effects of the three factors were evaluated in terms of the change in grapevine's vegetative growth characteristics included; single leaf area, chlorophyll content, number of lateral shoots, proline content in leaves, and some leaf's nutrient content Nitrogen, Phosphorus, and Potassium. All results were analysed statistically by using SAS programs (21), Duncan's multiple tests at a 5% level of portability were to compare the treatment according to (10).

RESULTS AND DISCUSSION

Single leaf area: Data in Table (1) shows that there are significant differences in the experimental factors on single leaf area of grapevine cv. Khoshnaw, as the tipped vine, outperformed the non-tipped vine by registering the highest leaf area (149.85 cm^2) and the non-tipped vine registered (133.74 cm^2). The effect of proline, the treatment (200 $mg.L^{-1}$) gave the highest rate of single leaf area (148.0 cm^2), which was higher that the leaf area of the control treatment (135.65 cm^2). We noted that the effect of botminn plus at the concentration of (6 $ml.L^{-1}$) recorded the highest rate of single leaf area (147.37 cm^2) which is not significantly different from vine treated with (3 $ml.L^{-1}$) as recorded (141.67 cm^2), while the same treatment is significantly superior on the non-treated vine which recorded the lowest rate of single leaf area (136.34 cm^2). Results showed that the interaction of (tipped vine + 200 mg.L-1 proline + 6 ml.L-1 botminn plus) gave the maximum value of the single leaf area (164.93 cm2) but was significantly the same as most of the other interaction except the interaction of (non-tipped vine+ 0 mg.L-1 proline + 3 ml.L-1 botminn plus) and control treatment.

Table 1. Effect of tipping and foliar application of proline and botminn plus on single leaf area (cm^2) of grapevine cv. Khoshnaw

Tipping	Proline ($mg.L^{-1}$)	Botminn Plus ($ml.L^{-1}$) 0	3	6	T x P	Mean effect of T*.
without Tipping	0	123.40 c	124.09 c	130.32 bc	125.94 c	133.74 b
	100	130.50 bc	133.43 bc	136.20 a-c	133.38 bc	
	200	138.69 a-c	141.82 a-c	145.16 a-c	141.89 ab	
Tipping	0	139.46 a-c	145.67 a-c	150.97 a-c	145.37 ab	149.85 a
	100	141.16 a-c	152.46 a-c	156.63 ab	150.08 a	
	200	144.86 a-c	152.54 a-c	164.93 a	154.11 a	
T x B	WT.	130.86 c	133.11 c	137.23 bc	Main effect of Proline	
	Tipping	141.83 bc	150.23 ab	157.51 a		
P x B	0	131.43 b	134.88 b	140.64 ab	135.65 b	
	100	135.83 ab	142.95 ab	146.42 ab	141.73 ab	
	200	141.78 ab	147.18 ab	155.05 a	148.00 a	
Mean effect of Bot.		136.34 b	141.67 ab	147.37 a		

Means with the same letter are not significantly different according to Duncan multiple ranges test at 5% level
*** T: Tipping, WT: without Tipping, P: Proline, BP: Botminn Plus**

The total leaf's Chlorophyll content

A difference in average chlorophyll content in grapevine's leaf of cv. Khoshnaw is highlighted in (table 2). The table demonstrates that the tipping grapevine shoot is far superior in chlorophyll content (169.19 $\mu g.m^{2-1}$) to the un-tipped grapevine shoot (165.23 $\mu g.m^{2-1}$). The different doses of proline are significantly different from one another in the leaf's total chlorophyll content, which (173.34 $\mu g.m^{2-1}$) resulted from the vine sprayed with (200 $mg.L^{-1}$) of proline, and this superior on spraying vine with a concentration of 100 $mg.L^{-1}$ of proline which gave (168.55 $\mu g.m^{2-1}$), and both of them were higher than total chlorophyll content in the unsprayed vine (156.74 $\mu g.m^{2-1}$).

Table 2. Effect of tipping and foliar application of proline and botminn plus on the total chlorophyll content (µg.m$^{2-1}$) of grapevine cv. Khoshnaw

Tipping	Proline (mg.L^{-1})	Botminn Plus (ml.L^{-1}) 0	3	6	T x P	Mean effect of T.
without	0	137.52 e	159.64 d	166.21 a-d	154.46 c	165.23 b
Tipping	100	162.39 b-d	170.02 a-d	172.69 a-c	168.37 ab	
	200	167.14 a-d	173.59 ab	177.87 a	172.87 a	
Tipping	0	160.62 cd	165.55 a-d	168.89 a-d	165.02 b	169.19 a
	100	165.43 a-d	168.24 a-d	172.52 a-c	168.73 ab	
	200	170.32 a-d	174.31 ab	176.81 a	173.81 a	
T x B	WT.	155.68 c	167.75 ab	172.26 a	Main effect of Proline	
	Tipping	165.45 b	169.37 ab	172.74 a		
P x B	0	149.07 d	162.60 c	167.55 bc	159.74 c	
	100	163.91 c	169.13 bc	172.61 ab	168.55 b	
	200	168.73 bc	173.95 ab	177.34 a	173.34 a	
Mean effect of B.		160.57 b	168.56 a	172.50 a		

Means with the same letter are not significantly different according to Duncan multiple ranges test at 5% level
*** T: Tipping, WT: without Tipping, P: Proline, BP: Botminn Plus**

Yielding (172.50 and 168.56 µg.m2-1) total chlorophyll content came from grapevines sprayed with (6 ml.L-1 and 3 ml.L-1) botminn plus respectively, which both are significantly superior on the unsprayed vine (160.57 µg.m2-1). Due to the triple effects of the study factors, the highest chlorophyll content (177.87 µg.m2-1) came from untipped vine + 200 mg.L-1 proline + 3 ml.L-1 botminn plus, also the interaction of tipped vine + 200 mg.L-1 proline + 6 ml.L-1 botminn plus was superior on some of the other interactions which recorded (176.37 µg.m2-1)

Lateral shoot number per vine

Table (3) shows the tipping of grapevine's shoot cv. Khoshnaw gave the highest rate of lateral shoot number per vine (109.04) compared to the non-tipping vine which recorded a minimum rate of lateral shoot number/per vine (76.37). Data revealed that the highest concentration of proline (200 mg.L^{-1}) gave the maximum lateral shoot number/vine (111.56), which was higher than both other concentrations of proline, while there is no significant difference between applying 100 mg.L^{-1} and 0 mg.L^{-1} of proline for the same characteristic. The highest lateral shoot number was found in spraying 6 ml.L^{-1} botminn plus, which is significantly superior to spraying 3 ml.L^{-1} and control treatment both recorded (83.11 and 87.44) lateral shoot number/vine respectively. The interaction treatment of (tipped vine + 200 mg.L^{-1} of proline + 6 ml.L^{-1} botminn plus) recorded the highest rate of lateral shoot number/vine (160.0), which is significantly more than most of the interactions, the lowest rate amounted to (50.67) which came from the treatment of (untipped vine + 100 mg.L^{-1} of proline + 0 ml.L^{-1} botminn plus).

Table 3. Effect of tipping and foliar application of proline and botminn plus on lateral shoot number (lateral shoot number.vine^{-1}) of grapevine cv. Khoshnaw

Tipping	Proline (mg.L^{-1})	Botminn (ml.L^{-1}) 0	3	6	T x P	Meaneffect of T.*
without	0	68.67 f-h	77.33 e-g	85.33 d-f	77.11 c	76.37 b
Tipping	100	50.67 h	58.67 gh	98.67 c-e	69.33 c	
	200	98.67 c-e	58.67 gh	90.67 d-f	82.67 bc	
Tipping	0	74.67 e-h	96.00 de	106.67 cd	92.44 b	109.04 a
	100	109.33 cd	69.33 f-h	104.00 cd	94.22 b	
	200	122.67 bc	138.67 ab	160.00 a	140.44 a	
T x B	WT.	72.67 c	64.89 c	91.56 b	Main effect of Proline	
	Tipping	102.22 b	101.33 b	123.56 a		
P x B	0	71.67 ef	86.67 c-e	96.00 b-d	84.78 b	
	100	80.00 d-f	64.00 f	101.33 bc	81.78 b	
	200	110.67 ab	98.67 bc	125.33 a	111.56 a	
Mean effect of B.		87.44 b	83.11 b	107.56 a		

Means with the same letter are not significantly different according to Duncan multiple ranges test at 5% level
*** T: Tipping, WT: without Tipping, P: Proline, BP: Botminn Plus**

Leaf proline content (%)

The results in table (4) shows tipped and non-tipped grapevine of cv. Khoshnaw did not significantly differ from one another in terms of proline content in leaf. Increasing the concentration of proline content resulted in a different rate of proline in the leaf; foliar application of (200 mg.L^{-1}) proline recorded the highest proline content (1.548 %), which is significantly superior on the non-sprayed vine (1.268 %). Also, results showed that there were no significant differences in the leaf's proline content due to the spraying of botminn plus. It is also noted that there were significant differences for the effect of three studied factors on leaf proline content, as founded that the treatment (tipped vine + 200 mg.L^{-1} of proline + 6 ml.L^{-1} botminn plus) it amounted to (160.0 %) which significantly not different from most of other interaction, while it higher that control treatment (1.123 %).

Table 4. Effect of tipping and foliar application of proline and botminn plus on the leaf content of Proline (%) grapevine cv. Khoshnaw

Tipping	Proline (mg.L^{-1})	Botminn plus (ml.L^{-1}) 0	3	6	T x P	Mean effect of T. *
without	0	1.123 b	1.270ab	1.243 ab	1.212 b	1.382 a
Tipping	100	1.587 ab	1.653 ab	1.270 ab	1.503 ab	
	200	1.713 ab	1.443 ab	1.133 b	1.430 ab	
Tipping	0	1.160 ab	1.400 ab	1.413 ab	1.324 b	1.461 a
	100	1.237 ab	1.603 ab	1.337 ab	1.392 ab	
	200	1.693 ab	1.567 ab	1.737 a	1.666 a	
T x B	WT.	1.474 a	1.456 a	1.216 a	Main effect of Proline	
	Tipping	1.363 a	1.523 a	1.496 a		
P x B	0	1.142 b	1.335 ab	1.328 ab	1.268 b	
	100	1.412 ab	1.628 a	1.303 ab	1.448 ab	
	200	1.703 a	1.505 ab	1.435 ab	1.548 a	
Mean effect of B.		1.419 a	1.489 a	1.356 a		

Means with the same letter are not significantly different according to Duncan multiple ranges test at 5% level
*** T: Tipping, WT: without Tipping, P: Proline, BP: Botminn Plus**

Nitrogen % in leaf-petiole

Nitrogen % in leaf-petiole was significantly affected by practicing the tipping of the grapevine's shoot; the tipped vine gave the highest value of N% (0.976 %), which is significantly higher than N% in the leaf-petiole of the non-tipped vine (table 5). Increasing the concentration of proline from 200 mg.L^{-1} to 100 mg.L^{-1} had the same significant effect on N% in the leaf-petiole (1.060 % and 1.016 %) respectively, however, both had significantly higher N% in the non-treated vine (0.716%). Foliar application of botminn plus not affected significantly the N% of leaf-petioles, by all different doses. Regarding the interaction among the three study factors tipped vine + 200 mg.L-1 of proline + 6 ml.L-1 botminn plus), data in the same table revealed that the highest value (1.282 %) is obtained by the interaction of (tipped vine + 200 mg.L-1 of P. + 6 ml.L-1 BP.) which is higher than most of the other interactions, the lowest N% (0.628 %) was at tipped vine + 0 mg.L-1 of P. + 6 ml.L-1 BP.).

Table 5. Effect of tipping and foliar application of proline and botminn plus on Nitrogen percent in leaf-petiole (%) of grapevine cv. Khoshnaw

Tipping	Proline (mg.L^{-1})	Botminn Plus (ml.L^{-1}) 0	3	6	T x P	Mean effect of T. *
without	0	0.657 hi	0.697 g-i	0.770 f-i	0.708 c	0.885 b
Tipping	100	1.198 a-c	0.861 e-i	0.918 d-g	0.992 b	
	200	0.923 d-g	0.990 b-f	0.950 c-g	0.954 b	
Tipping	0	0.711 g-i	0.833 e-i	0.628 i	0.724 c	0.976 a
	100	0.897 d-h	1.003 b-f	1.220 ab	1.040 ab	
	200	1.141 a-d	1.072 a-e	1.282 a	1.165 a	
T x B	WT.	0.926 ab	0.849 b	0.879 b	Main effect of Proline	
	Tipping	0.917 ab	0.969 ab	1.043 a		
P x B	0	0.684 c	0.765 c	0.699 c	0.716 b	
	100	1.048 ab	0.932 b	1.069 ab	1.016 a	
	200	1.032 ab	1.031 ab	1.116 a	1.060 a	
Mean effect of B.		0.921 a	0.909 a	0.961 a		

Means with the same letter are not significantly different according to Duncan multiple ranges test at 5% level
*** T: Tipping, WT: without Tipping, P: Proline, BP: Botminn Plus**

Phosphor percent (P %) in leaf-petiole

Concerning the effect of tipping grapevine shoots on phosphor % in leaf-petiole content in grapes of cv. Khoshnaw, data revealed that the highest value (0.169 %) was obtained from tipped vine however the lowest P% was at control treatment (0.153 %). The same table revealed that spraying grapevine with proline concentrations had a significant effect on P% in leaf-petiole, especially at the concentration (200 mg.L^{-1}) gave the maximum value (0.192 %), which is significantly higher than spraying (100 mg.L^{-1} and 0 mg.L^{-1}) proline, that gave (0.150 % and 0.141 %) respectively.

Table 6. Effect of tipping and foliar application of proline and botminn plus on Phosphor % in leaf-petiole of grapevine (*Vitis vinifera* L.) cv. Khoshnaw

Tipping	Proline (mg.L^{-1})	Botminn plus (ml.L^{-1}) 0	3	6	T x P	Mean effect of T. *
without	0	0.116 i	0.117 hi	0.124 hi	0.119 c	0.153 b
Tipping	100	0.132 f-i	0.148 d-i	0.175 a-e	0.152 b	
	200	0.166 b-f	0.196 a-c	0.206 a	0.189 a	
Tipping	0	0.139 e-i	0.186 a-d	0.165 b-g	0.163 b	0.169 a
	100	0.156 d-h	0.126 g-i	0.164 c-g	0.149 b	
	200	0.205 ab	0.179 a-d	0.199 a-c	0.194 a	
T x B	WT.	0.138 c	0.153 bc	0.168 ab	Main effect of Proline	
	Tipping	0.166 ab	0.164 ab	0.176 a		
P x B	0	0.127 d	0.151 cd	0.144 cd	0.141 b	
	100	0.144 cd	0.137 d	0.169 bc	0.150 b	
	200	0.185 ab	0.187 ab	0.203 a	0.192 a	
Mean effect of B.		0.152 b	0.159 ab	0.172 a		

Means with the same letter are not significantly different according to Duncan multiple ranges test at 5% level
*** T: Tipping, WT: without Tipping, P: Proline, BP: Botminn Plus**

Foliar application of botminn plus gave a significant increase in P% in leaf-petiole, spraying of (6 ml.L^{-1}) botminn plus obtained (0.172 %) followed by (3 ml.L^{-1}) botminn plus which gave (0.159 %), and the lowest value (0.152 %) was obtained from the control treatment. The triple interaction of all the factors caused highly significant differences in the P% in leaf-petiole, in which the highest significant value (0.206 %) was given by the interaction combination of non-tipped vine + 200 mg.L^{-1} proline + 6 ml.L^{-1} botminn plus, while the lowest value (0.116 %) was recorded from non-treated one.

Potassium percent (K %) in leaf-petiole

table (7) shows that tipping of grapevine shoots cv Khoshnaw gave the highest average K% of leaf-petiole (1.25 %) which was significantly dominant on K% of untipped grapevine with the existence of significant differences (1.11 %). Regarding the single effects of spraying proline at three different doses, showed the best results of K% of leaf-petiole (1.32 %) by spraying (200 mg.L^{-1}) proline which was significantly higher than spring (100 mg.L^{-1}) proline (1.13 %) and (0 mg.L^{-1}) proline (1.09 %). Also, the important effects of the single treatment of botminn plus on K% in leaf-blade, the highest concentration of botminn plus recorded (1.26 %) K%, which significantly superior on K% in leaf petiole of spraying (3 ml.L^{-1}) botminn plus and unsprayed vine as both gave (1.14 %). Results pointed to the effects of the interaction of all study factors on K% in leaf petiole, the best results were for the interaction of un-tipped vine + 200 mg.L^{-1} proline + 6 ml.L^{-1} botminn plus which registered (1.46 %), and also the interaction of tipped vine + 0 mg.L^{-1} proline + 3 ml.L^{-1} botminn plus that gave (1.45 %), the lowest value of K% was registered from the interaction of (non-tipped vine + 0 mg.L^{-1} P. + 3 ml.L^{-1} BP.) treatment and control (0.77 % and 0.83 %) respectively.

Table 7. Effect of tipping and foliar application of proline and botminn plus on potassium % in leaf-petiole of grapevine cv. Khoshnaw

Tipping	Proline ($mg.L^{-1}$)	Botminn Plus ($ml.L^{-1}$) 0	3	6	T x P	Mean effect of T. *
without	0	0.77 g	0.83 g	1.05 f	0.88 e	1.11 b
Tipping	100	1.11 ef	0.90 g	1.26 b-e	1.09 d	
	200	1.45 a	1.18 d-f	1.46 a	1.36 a	
Tipping	0	1.07 f	1.45 a	1.34 a-c	1.29 ab	1.25 a
	100	1.17 d-f	1.27 b-d	1.09 f	1.18 c	
	200	1.25 b-e	1.20 c-d	1.39 ab	1.28 b	
T x B	WT.	1.11 b	0.97 c	1.26 a	Main effect of Proline	
	Tipping	1.16 b	1.31 a	1.27 a		
P x B	0	0.92 d	1.19 bc	1.20 b	1.09 b	
	100	1.14 bc	1.08 c	1.18 bc	1.13 b	
	200	1.35 a	1.19 b	1.42 a	1.32 a	
Mean effect of B.		1.14 b	1.14 b	1.26 a		

Means with the same letter are not significantly different according to Duncan multiple ranges test at 5% level
*** T: Tipping, WT: without Tipping, P: Proline, BP: Botminn Plus**

Table 1-7 indicates that in all studied factors worked to improve these vegetative characteristics; since, tipping caused a significant improvement in all parameters undertaken in this study except total phenol percentage, the reason for improving these parameters may be attributed to that tipping removes the impact of apical dominance and thus stimulates the growth of single leaf area, chlorophyll content and increases the number of lateral shoots as soon as N, P, and K percentage in leave petiole (al -hawizi) and these lead to increasing photosynthetic produces which lead to increase the direction of translocation reversed down to sources of growth (bar bhari and al arrush 2016), also the improvement may due to that the tipping causes the termination of apical dominance, which encourages the formation of lateral branches (Table 3) that increase the leaf area which facilitates the process of photosynthesis and the formation of carbohydrates that are exploited in the propagation of vegetative and root growth. The improvement that occurred in vegetative growth parameters as a result of the addition of proline may be attributed to that exogenous proline application works as an additional source of nitrogen (N) that is required for survival and growing the plant under stress, So, one of the determinations of good vine vigor can be the accumulation of nitrogen in the shape of a free amino acid (24, 14). Proline also has a significant effect on these traits, since the proline plays a role in the osmotic potential of cells, it also acts as an antioxidant as it can increase plant stress tolerance by developing an antioxidant system. Also, foliar spraying with proline acid works to increase plant height, and this is due to its positive role, in addition to being a preservative; it regulates the osmotic potential that preserves the cell from oxidation A maintains an enzyme on cellular structures, so it works to increase growth, maintain elongation of cells, reopen stomata and increase The speed of photosynthesis (9). The positive effect of botminn plus may be due that its containing (Humic & Fulvic Acid, Organic Matter, Nitrogen) that have great role in improving vegetative growth, nutritional status and reduced the residuals of nitrate and nitrite and the continuous fertilization with organic fertilizer is promising in the long run for grapevine (17,13 , 19), in additions to the role of humic acid and Fulvic acid is a medium that regulates plant growth, and contributes to the promotion of multiple functions such as increasing the permeability of the cell membrane, raising the efficiency of photosynthesis of plants, and controlling hormone levels (12).

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