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Effects of Grapevine Girdling

on ripening time, bunch and berry quality, and volume **in different trellising systems and production micro-zones in Uzbekistan**

Gholib Mahmudov

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Effects of Grapevine Girdling

- Girdling

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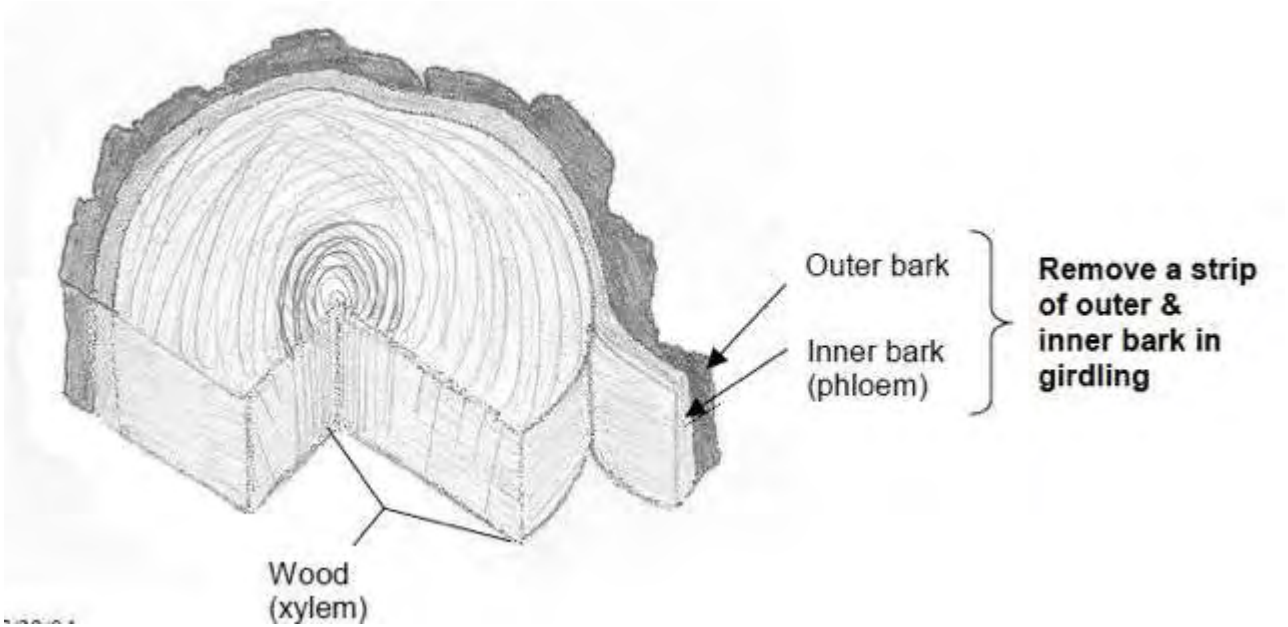
About Girdling

- Removal of a phloem all the way around the trunk, cordon, or cane
- Girdling is performed between *nouaison* (berry set) and 2 to 3 week before the *veraison* (start of maturation).
- 3-6 millimeters of a bark strip is removed

Grapevine Girdling



Adopted from
UC California website

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Girdling Knife

- Double Bleed
- 6 мм size (between blades)

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About Girdling

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About Girdling

- Girdling disrupts the downward flow of carbohydrates and hormones through the outer bark for 2-3 weeks

- Girdle points heal in 2 -4 weeks (callus formation), and the food and hormone flow restore

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Healing of a girdle point

Expected Effects

- When done correctly increases the berry size of most seedless table grape varieties, and seeded ones (proved in this project)

- It can also speed up maturation of berries

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Girdled Cordon

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Wrong Application of Girdling

- Girdle size exceeded 6 мм
- Negative Effects:
  - Callus can't cover whole wound
  - Grapevine is killed

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Experimented Some Vitis Vinifera Samples

Andijon Qora

Rizamat

Oq Khusayni

Nimrang

Varieties, geographic zones, trellising and training systems, and pruning methods.

#	Trellis system	Tested Varieties	Grapevine Training & Canopy System	Location of experiment	Pruning Methods
1	**"I" vertical 4 wire**	Vitis Vinifera: Andijon Qora, Rizamat, Oq Khusayni, Nimrang. *(Covered Grapevine Cultivation Micro-Zon : Protected from frost)*	Trunkless Multi-cordon Fan-like vertical canopy	Buloqboshi District, Andijan Province, Uzbekistan	Combined Spur & Cane pruning
2	**Lyre 7 wire**		Trunkless Multi-cordon Fan-like "V" shape canopy	Buloqboshi District, Andijan Province, Uzbekistan	
3	**"Altyarik" Horizontal Roofing**	Vitis Vinifera: Andijon Qora, Rizamat, Oq Khusayni, Nimrang, Pobeda.*(Covering Zone: Protected from frost)*	Head Trained Multi-cordon horizontal canopy	Buloqboshi District, Andijan Province, Uzbekistan	
		Vitis Vinifera: Rizamat, Pobeda, Qora Kishmish, Khusayni Kelin Barmoq, Shohonak*. *(Not-covered Grapevine Cultivation Micro-Zone:not protected from frost)*	Head Trained Multi-cordon horizontal canopy	Kuvasoy District, Fergana Province, Uzbekistan	

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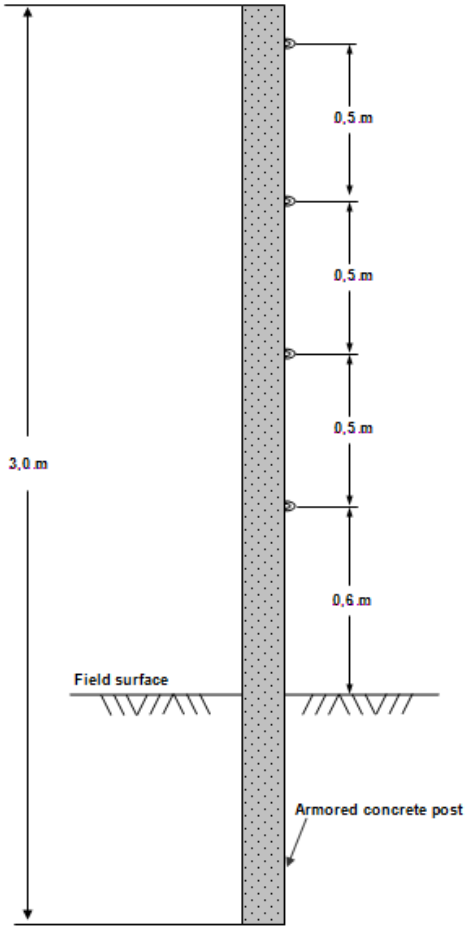
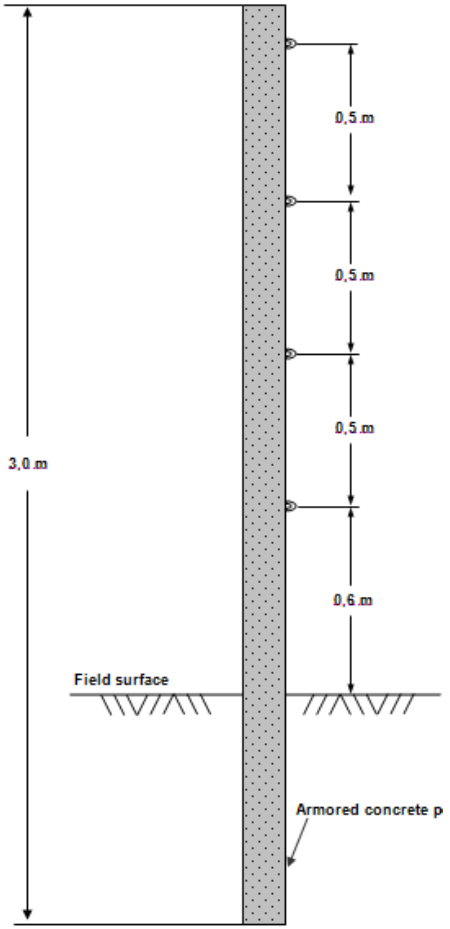
Experiment Criteria Summary

#	Variety	Location of experiment	Trellis system	Frost Protected	Girdling Type	Number of girdled vines			Total per Trellis type	Total Trunk Girdling		Total Cordon Girdling	Total per Variety
						2014	2015	2016		Frost Protected	Not protected		
1	**Andijon Qora**	Buloqboshi	"I" vertical 4 wire	yes	Cordon	5	6	6	17	6	0	32	38
			Lyre 7 wire	yes	Cordon	4	4	7	15				
			"Altyarik" horizontal	yes	Trunk	2	2	2	6				
2	**Rizamat**	Buloqboshi	"I" vertical 4 wire	yes	Cordon	2	10	94	106	7	6	169	182
			Lyre 7 wire	yes	Cordon	2	5	56	63				
			"Altyarik" horizontal	yes	Trunk	2	5	0	7				
		Kuvasoy	"Altyarik" horizontal	no	Trunk	0	0	6	6				
3	**Oq Khusayni**	Buloqboshi	"I" vertical 4 wire	yes	Cordon	1	2	4	7	5	0	13	18
			Lyre 7 wire	yes	Cordon	2	2	2	6				
			"Altyarik" horizontal	yes	Trunk	1	2	2	5				
4	**Nimrang**	Buloqboshi	"I" vertical 4 wire	yes	Cordon	0	2	2	4	2	0	6	8
			Lyre 7 wire	yes	Cordon	0	0	2	2				
			"Altyarik"	yes	Trunk	0	0	2	2				
5	**Pobeda**	Buloqboshi	"Altyarik" horizontal	yes	Trunk	1	5	0	6	6	0	0	8
		Kuvasoy		no	Trunk	0	0	2	2	2	0	0	
6	**Qora Kishmish**	Kuvasoy	"Altyarik" horizontal	no	Trunk	0	0	2	2	0	2	0	2
7	**Khusayni Kelin Barmoq**	Kuvasoy	"Altyarik" horizontal	no	Trunk	0	0	2	2	0	2	0	2
8	**Shohonak**	Kuvasoy	"Altyarik" horizontal	no	Trunk	0	0	2	2	0	2	0	2
Total Per Year and / or Experiment Type						22	45	193	-	28	12	-	-
Total						**260**			**260**	**40**		**220**	**260**

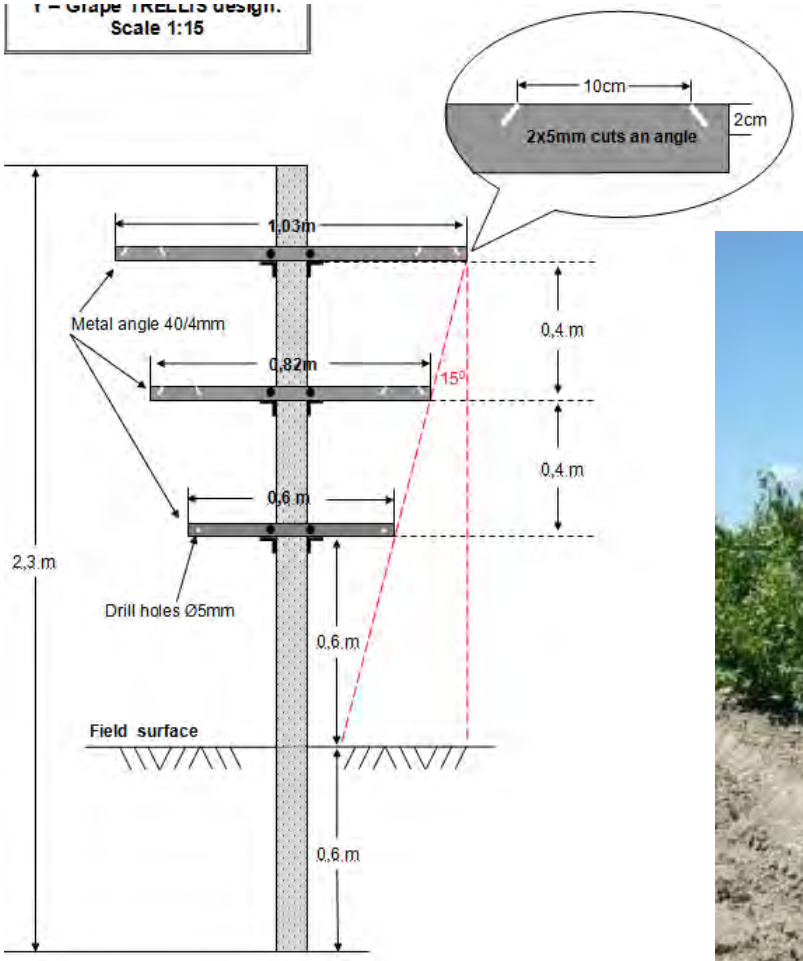
Girdling by Trellising Types – “I” vertical



Girdling by Trellising Types – “Altyarik” horizontal Roofing



Girdling by Trellising Types – "Lyre" V shape



Trunk and cordon girdling in numbers per variety and location

#	Variety	Location of experiment	Trunk Girdling		Cordon Girdling	Total per Variety
			Frost Protected	Not protected		
1	Andijon Qora	Buloqboshi	6	0	32	38
2	Rizamat	Buloqboshi	7	0	169	176
		Kuvasoy	0	6	0	6
3	Oq Khusayni	Buloqboshi	5	0	13	18
4	Nimrang	Buloqboshi	2	0	6	8
5	Pobeda	Buloqboshi	6	0	0	8
		Kuvasoy	2	0	0	
6	Qora Kishmish	Kuvasoy	0	2	0	2
7	Khusayni Kelin Barmoq	Kuvasoy	0	2	0	2
8	Shohonak	Kuvasoy	0	2	0	2
Total Per Experiment Type			28	12	220	260
Total			40		220	260

Girdled per Trellising types

#	Variety	Location of experiment	Girdled Per Trellis Type				Total per Variety
			"I" Vertical 4 wire	Lyre 7 wire	Altyarik Horizontal frost protected	Altyarik Horizontal not frost protected	
1	**Andijon Qora**	Buloqboshi	17	15	6	0	38
2	**Rizamat**	Buloqboshi	106	63	7	0	176
		Kuvasoy	0	0	0	6	6
3	**Oq Khusayni**	Buloqboshi	7	6	5	0	18
4	**Nimrang**	Buloqboshi	4	2	2	0	8
5	**Pobeda**	Buloqboshi	0	0	6	0	6
		Kuvasoy	0	0	0	2	2
6	**Qora Kishmish**	Kuvasoy	0	0	0	2	2
7	**Khusayni Kelin Barmoq**	Kuvasoy	0	0	0	2	2
8	**Shohonak**	Kuvasoy	0	0	0	2	2
Total per Trellis System			134	86	26	14	260

Assessment Criteria

- The ripening time
- Berry color
- Berry and bunch weights
- And, berry brix levels of girdled compared to the controls

Girdling and Maturation Time

#	Variety	2014				2015				2016			
		Girdle		Control Mature date	Girdled Mature early by days	Girdle		Control Mature date	Girdled Mature early by days	Girdle		Control Mature date	Girdled Mature early by days
		Date	Mature date			Date	Mature date			Date	Mature date		
1	Andijon Qora	28-Jun	15-Jul	1-Aug	16	15-May	20-Jul	3-Aug	14	6-May	7-Jul	23-Jul	16
2	Rizamat	28-Jun	15-Jul	1-Aug	16	15-May	24-Jul	8-Aug	14	7-May	16-Jul	2-Aug	17
		-	-	-	-	-	-	-	-	5-Jun	28-Jun	25-Jul	23
3	Oq Khusayni	28-Jun	20-Aug	15-Sep	26	15-May	26-Aug	25-Sep	30	6-May	27-Jul	20-Aug*	24*
4	Nimrang	-	-	-	-	15-May	25-Jul	15-Aug	21	6-May	20-Jul	20-Aug*	30*
5	Pobeda	17-Jun	25-Jul	10-Aug	16	15-May	1-Aug	17-Aug	16	-	-	-	-
										5-Jun	5-Aug	20-Aug*	15*
6	Qora Kishmish	-	-	-	-	-	-	-	-	5-Jun	22-Jul	20-Aug*	29*
7	Khusayni Kelin Barmoq	-	-	-	-	-	-	-	-	5-Jun	10-Jul	10-Aug	31
8	Shohonak	-	-	-	-	-	-	-	-	5-Jun	28-Jul	23-Aug*	26*

Girdling and Maturation Time

#	Variety	Experiment Location	Trellis system	Girdled mature early by days			
				2014	2015	2016	Average
1	**Andijon Qora**	Buloqboshi	"I" vertical	16	14	16	15
2	**Rizamat**	Buloqboshi	"I" vertical	16	14	17	16
		Kuvasoy	"Altyarik" horizontal	-	-	23	23
3	**Oq Khusayni**	Buloqboshi	"I" vertical	26	30	24*	28
4	**Nimrang**	Buloqboshi	"I" vertical	-	21	30*	21
5	**Pobeda**	Buloqboshi	"I" vertical	16	16	-	16
		Kuvasoy	"Altyarik" Horizontal Roofing			15*	15**
6	**Qora Kishmish**	Kuvasoy	"Altyarik" Horizontal Roofing	-	-	29*	29**
7	**Khusayni Kelin Barmoq**	Kuvasoy	"Altyarik" Horizontal Roofing	-	-	31	31
8	**Shohonak**	Kuvasoy	"Altyarik" Horizontal Roofing	-	-	26*	26**

* expected maturation days, ** expected average days

Girdling and Maturation Time

- The difference in cluster (berry) maturation times between girdled and not girdled (control) grapevines varied between 14 to 30 days for all varieties.
- Altyarik Horizontal Roof trellising system was superior over Vertical "I" system when maturation time is important especially for Vitis Vinifera Oq Khusayni and Vitis Vinifera Khusayni Kelin Barmoq.
- Geographic zone climatic factors played a more important role than trellis type in explaining the variation of ripening time at girdling for most seeded table grape varieties in Uzbekistan.

Girdling and Berry / Cluster Weight

#	Variety	Trellising	Measure date	Average Berry weight, gram		Increase of berry weight	Average Bunch weight, gram		% increase of bunch weight
				Control*	Girdled		Control*	Girdled	
1	Andijon Qora	"I" vertical	7-Jul-16	3.9	5.0	22%	330	380	13.2%
2	Rizamat		16-Jul-16	7.9	9.1	13%	630	700	10.0%
3	Oq Khusayni		27-Jul-16	3.3	5.0	34%	335	500	33.0%
4	Nimrang		20-Jul-16	5.1	7.0	27%	570	800	28.8%
Average "I" vertical				5.1	6.5	23%	466	595	21.6%
5	Pobeda	Altyarik Horizontal Roofing	14-Aug-16	6.0	8.4	29%	490	790	38.0%
6	Qora Kishmish		14-Aug-16	2.0	2.3	13%	560	655	14.5%
7	Khusayni Kelin Barmoq		14-Aug-16	4.9	6.8	28%	450	660	31.8%
8	Shohonak		14-Aug-16	4.0	6.0	33%	336	528	36.4%
Average "Altyarik" Horizontal Roofing				4.2	5.9	28%	459	658	30.3%

* Control are unmature or partly mature at weight measured time

Girdling and Berry / Cluster Weight

- No significant difference in average berry and cluster values obtained by trellising systems.

- Average increase in berry weight in girdled over control in “Altyarik” was 28% compared to 23% in the “I” system, and the values for clusters are 30.3% and 21.6%, respectively

- Vitis species Oq Khusayni (blank), Pobeda (noir) and Shohonak were the best performing varieties with the highest percentage increase in berry and bunch weight after girdling

Girdling and Degrees Brix

#	Variety	Trellis type	Measured Date	Degrees Brix			Comments
				Control*	Girdled	% difference	
1	Andijon Qora	"I" vertical	7-July-2016	11	19	42.1%	Covered grapevine cultivation micro-zone in Bulokboshi
2	Rizamat		16-July-2016	13	19	31.6%	
3	Oq Khusayni*		27-July-2016	10	17	41.2%	
4	Nimrang		20-July-2016	12	19	36.8%	
Average degrees brix for "I" vertical				11.5	18.5	37.8%	
1	Pobeda	Altyarik Horizontal Roofing	14-Aug-16	12	16.5	27.3%	Not-Covered grapevine cultivation micro-zone in Kuvasoy
2	Qora Kishmish		14-Aug-16	17	19	10.5%	
3	Khusayni Kelin Barmoq		14-Aug-16	12	18.5	35.1%	
4	Shohonak		14-Aug-16	11	17	35.3%	
Average degrees brix for "Altyarik" horizontal				13.0	17.8	26.8%	

* Control are unmature or partly mature at degrees brix measured time

Girdling and Degrees Brix

- Average values of degrees brix for the eight tested varieties in both zones remained about the same as the controls.

- However, the average degrees brix of girdled varieties in the "I" system in the covered micro-zone are high (37.8%) compared to the uncovered zone grapes in "Altyarik" horizontal system (26.8%).

Girdling and Degrees Brix

- Perhaps more sugar accumulation in berries of grapes tested in the Bulokboshi covered micro-zone occurred due to the time of girdling application rather than the variety characteristics.

- Girdling timing appears to have overwhelming influence on higher sugar accumulation than other factors such as cultivation geographic location, applied trellising and grapevine training methods.

Girdling and Maturation Level

- The number of matured (evaluated by berry color) berries in girdled over the control were 5.3 – 5.7 and 4.6 – 6.7 times more in Vitis Vinifera Andijon Qora and Vitis Vinifera Rizamat, respectively.

- No significant variation at maturation was observed in both varieties regarding girdled versus the control when trellising systems are compared, although Rizamat in Altyarik Horizontal Roof trellising resulted in 6.7 times more matured in girdled over non-girdled

Girdling and Berry & Cluster Size

- Observed average increase of a berry size is 30% in length and 37% in width in the Vitis Vinifera Andijon Qora and 21-72% in the Vitis Vinifera Rizamat in the girdled vines in “I” trellis systems.

- A similar situation is also true under “Lyre” and “Altyarik” systems for both varieties.

Girdling and Berry & Cluster Size

- Increased bunch size in all varieties under all trellising systems was not proportional to berry size perhaps due to compact distribution of berries within a bunch.
- However, the average increase of a bunch by length and width was somewhat proportional for late and mid-late varieties Vitis Vinifera Nimrang and Vitis Vinifera Oq Khusayni.
- Interestingly, the increase in berry width over length in girdled is about 2-3 times higher in Andijon Qora and about 50% more in Vitis Vinifera Rizamat, which are both early ripening varieties

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Brix Measure - Refractometer

Bulokboshi Covered Zone

- 2-3 weeks early maturation of the Vitis Vinifera Andijon Qora

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Bulokboshi Covered Zone

- Vitis Vinifera Rizamat matured 2 weeks earlier than its normal ripening time

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Andijon Qora girdled to control Comparison ("I" trellis)

Rizamat girdled to control Comparison ("I" trellis)

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Rizamat girdled to control Comparison

- 16 days early ripening
- Above: a bunch on a girdled cordon
- Control: a bunch in a regular (not-girdled)

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Thank your for your attention!

- Questions, please.