



EFFECT OF VARIETY, IRRIGATION INTERVAL AND MULCHING OF MOTHER PLANT ON THE SEED QUALITY OF TOMATO (*Solanumlycopersicum L.*)

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ABSTRACT

A study to determine the effect of irrigation interval and mulching of the mother plant on seed viability and vigour was conducted in the Crop Production Laboratory of Federal University of Technology, Minna. Fully ripen fruits from plants of four tomato varieties (Roma VF, Ibadan local, Ife 1 and UC82B) that were subjected to four irrigation intervals (2, 4, 6 and 8) and mulching (with and without) were harvested and the seed extracted from them were dried under room temperature at 25 °C for five days. Seeds from the four varieties were spread in open plastic Petri dishes and were subjected to 30 °C and about 70% relative humidity in a growth chamber to accelerate ageing for 16 weeks. Seed samples were drawn and tested for germination and seedling emergence; seedling height and number of leaves per seedling at 0, 2, 4, 6, 8, 10, 12, 14 and 16 weeks of storage were also recorded. Irrigating tomato at 8 days interval resulted in poor seed germination. Although seeds extracted from fruits produced under mulching generally resulted in higher germination percentage compared to no mulching, the difference was only significant at 16 weeks after storage (WAS). The interaction effect of irrigation interval, mulching and variety on germination percentage was significant.

Keywords: Irrigation interval, seed quality, mother plant.

INTRODUCTION

The basic input in vegetable production is good seed. It has been reported that among the major constraints to vegetable production in Africa is non-availability of good seeds (Adeboye *et al.*, 2000). Environmental conditions during plant growth and development especially during seed formation affect seed quality and therefore can affect seedling establishment in the next growing season (Zakaria *et al.*, 2009) and consequently affects the yield. Most farmers in developing countries produce tomato during the rainy season with comparatively less production during the dry season probably due to limited supply of water. And water limitation during growth and



Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

development of plants is reported to affect seed yield and quality (Younesi and Moradi, 2009). Gharib *et al.* (2009) reported that irrigation interval of 7 or 14 days coupled with application of 86 kg N ha⁻¹ gave the highest grain yield in wheat and resulted in significantly higher seed storability up to 12 months. However, Ghambari *et al.* (2007) reported that irrigation intervals had no significant effect on germination index and germination percentage of pumpkin. Mulching is any material used in covering the soil in order to conserve soil moisture, lower soil temperature, reduce the impact of soil erosion and smoother weed growth. For instance Hanada (1991) reported that soil moisture content of bare soil in the carrot fields fluctuated as rainfall occurred but was quite stable in soil under mulching. Yong-Shan *et al.* (2007) reported significant effect of plastic film mulch on the modification of soil water content, temperature and nutrient status. Mulching was reported to enhance growth and yield of crops (Chaudhry *et al.*, 2004; Tariq and Haider, 2001; Makoto and Shigekata, 1994; Hanada, 1991) and have been utilized to great advantage in the development of horticultural crops (Smolikowski *et al.*, 2001). Vieira *et al.* (1992) also reported that seed quality and vigour are influenced by various factors experienced during the growth and development. In fact variations in seed quality among populations in some plant species have been attributed to differences in environmental conditions of the mother-plant (Uniya *et al.*, 2011). The objective of this study was therefore to determine the effect of irrigation interval and mulching of mother plant on the quality of tomato seeds.

MATERIALS AND METHODS

Four varieties of tomato (Ibadan local, Ife 1, Roma VF and UC82B) were subjected to four irrigation intervals (2, 4, 6 and 8 days) and two level of mulching (with and without) during the plant growth at the Teaching and Research Farm of Federal University of Technology, Minna (9°40'N and 6°30'E), in the Southern Guinea Savannah region of Nigeria. Rice straw was used as mulching material at the rate of 5 tones ha⁻¹ while about 90 liters of water was applied at each irrigation event to a plot size of 9m². Fruits were harvested when fully ripened and the seed/juice mixture (pulp) was removed immediately and left to ferment for four days after which the seeds were washed under running tap water and dried at room temperature. The seeds were then



Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

subjected to accelerated ageing at a temperature of 30°C and 70 % relative humidity in a growth chambers to determine the relative longevity of seeds from different treatments. The experiment was conducted in the laboratory of Department of Crop Production Federal University of Technology, Minna, Nigeria. Four replicates of 50 seeds were placed on water-moistened absorbent paper in Petri dishes and then incubated at 30°C. Germination counts were taken every-other-day for 28 days and the absorbent paper was moistened whenever is over be dried. In order to study seedling growth, three replicates of 10 seeds were sown into 5 kg of soil in plastic potson each sampling day. The pots were watered before planting and as at when due. Germination and seedling emergence rates were calculated according to Ellis and Roberts (1980).

$\sum Dn/\sum n$ Where:

D = number of days from the beginning of germination or emergence test.

n = number of seeds that germinated or emerged on day D.

Data were collected on germination percentage and rates, seedling emergence and rates, seedling height and number of leaves. These were subjected to analysis of variance (ANOVA) using the SAS (1999) package. Where significant, means were separated using LSD. The interaction effects were separated using DMRT. Significance was tested at 5 % unless otherwise stated.

RESULTS

Table 1 shows that irrigation interval (I) to which mother plants were subjected and variety (V) had significant effect ($P \leq 0.05$) on seed germination even though the trend varied with storage period. Mulching (M) generally resulted in higher germination percentage compared to no mulching. However, the difference was only significant at 16 WAS. Germination test result before the seeds were subjected to storage condition indicated that there were no significant differences among seeds produced at 2, 4 and 8 days irrigation intervals. But these values were significantly higher than 6 days irrigation interval. Slight increases in germination percentage of seeds produced under 2 and 4 irrigation intervals and sizeable increase in those produced under 6 days irrigation intervals were recorded at 2 WAS while a converse observation was recorded under 8 days irrigation interval. There was a decline in germination percentage as from 4 to 6 WAS and this



Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

continued throughout the storage period. The superiority of one irrigation interval over the other was inconsistent for the first 10 WAS. However, as from 12 WAS results revealed that seeds produced under 8 days irrigation interval germinated significantly lower than those of other irrigation intervals.

In most parts of the storage periods, seeds of Ibadan and Ife 1 germinated better than those of Roma VF and UC82B. Furthermore, UC82B was generally superior in germination to Roma VF. No significant interaction effect of irrigation interval and variety, irrigation interval and mulching and mulching and variety was recorded throughout the storage period. The interaction effect of irrigation interval, mulching and variety on seed germination was significant at 0, 2, 4, 8 and 10 WAS.

Seed germination percentage of mulched and unmulched treatment did not differ significantly within a variety under the same irrigation intervals (Table 2). Even though mulching of mother plant had no significant effect on the germination of the seeds produced, Table 2 reveals that the response to mulching varied with irrigation interval and variety. For example under 2 days irrigation interval unmulched Roma VF produced seeds with poorer germination but the value obtained was only significantly lower than that of UC82B with and without mulch at 0 to 8 weeks of storage and that of Ife 1 without mulch at 0 to 10 weeks of storage. At 4 days irrigation interval, mulched plants of Roma VF and unmulched plants of UC82B had seed with lowest germination but values were at par with all others except that from unmulched plants of Ibadan Local and Ife 1.



Table 1: Effect of irrigation interval, mulching and variety on tomato seed germination percentage

Factors	Storage period (weeks)												
	6		8		10		0	14		2	4		
<u>Irrigation interval (I)</u>													
2 days						87a		91a		89a		77a	71a
	43a	29a	16a	03a									
4 days						88a		90a		84ab		75a	65b
	45a	32a	11b	04a									
6 days						77b		89a		80b		73a	63b
	38b	19b	09b	02b									
8 days						91a		85a		87a		77a	73a
	40a	16c	08c	01c									
<u>Mulching (M)</u>													
Mulch						90a		93a		86a		77a	70a
	49a	22a	12a	04a									
No mulch						89a		95a		84a		74a	66a
	40a	20a	10a	01b									
<u>Tomato varieties (V)</u>													
Roma VF						85b		79c		75c		60c	55b
	46a	20b	09c	02b									
UC82B							89a		84b		83b		71b
	52b	32b	17c	24a			06a						
Ibadan local								93a		91a		83a	80a
	49a	22a	11c	01b									
Ife 1							93a		91a		90a		84a
	80a	44a	20b	16b			05a						



ISSN: 2346-7371 (PRINT)
2682-4965(ONLINE)

Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

Interaction

I x M				NS		NS		NS		NS		NS
	NS		NS		NS		NS		NS		NS	
I x V				NS		NS		NS		NS		NS
	NS	NS		NS		NS		NS		NS		NS
M x V					NS		NS		NS		NS	
	NS		NS		NS		NS		NS		NS	
V x M x I				*		*		*		*		NS
	*		*		NS		NS		NS		NS	

Means followed by the same letter(s) in the same column for each factor are not significantly different at $P \leq 0.05$ using Duncan Multiple Range Test (DMRT). NS = Not significant. (*) Significant at 5 %



Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

Table 2: Interaction effect between irrigation interval, mulching and variety on seed germination percentage
Before storage

Irrigation interval		Mulching		Variety
UC82B		Ibadan local	Ife 1	Roma VF
2			Mulch	90a-g
88a-g			Mulch	84d-g
No mulch	80g			94a-f
93a-f				84e-g
4			Mulch	80g
89a-g		87c-g		89a-g
			No mulch	84e-g
80g		94a-e		94a-d
6			Mulch	87c-g
80g		95abc		94a-e
			No mulch	87c-g
91a-g		96ab		91a-d
8			Mulch	89a-g
91a-g		94a-f		97a
			No mulch	82fg
84c-g		89a-g		94a-f
SE ±				1.76
<u>2 weeks after storage</u>				
2			Mulch	86b-g
92a-e		89a-g		88a-g
			No mulch	65j
86b-g		91a-f		92a-e
4			Mulch	81d-i
80e-j		90a-e		90a-e
			No mulch	75f-j
75g-j		93a-e		97a
6			Mulch	69ij
80e-j		90a-g		91a-e
			No mulch	82e-j
80e-j		96abc		89a-g
8			Mulch	94a-d
85c-h		96ab		89a-g



Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

90a-f	93a-e	No mulch	71hij	
SE ±			90a-g	1.81
<u>4 weeks after storage</u>				
2		Mulch	79d-l	
83b-k	90a-g		85a-j	
		No mulch	64l	
85a-j	92a-f		93a-d	
4		Mulch	74i-l	
71j-l	88a-i		93a-d	
		No mulch	70j-l	
79e-l	89a-h		94a	
6		Mulch	67ij	
77g-l	92a-e		66kl	
		No mulch	71jkl	
78f-l	90a-g		92a-f	
8		Mulch	95ab	
75h-l	91a-g		93abc	
		No mulch	73i-I	
80c-l	95a		94ab	
SE ±				1.90
<u>8 weeks after storage</u>				
2		Mulch	71a-h	
85a-d	75a-g		67c-i	
		No mulch	56g-l	
61g-k	61g-k		67c-i	
4		Mulch	65e-I	
44i-l	84a-e		75a-g	
		No mulch	43j-i	
54g-l	56g-l		83a-f	
6		Mulch	32l	
47i-l	85abc		66d-i	
		No mulch	39kl	
37l	87ab		83a-f	
8		Mulch	56g-l	
49h-l	90a		86ab	
		No mulch	71b-h	
63f-j	74a-g		85a-d	
SE ±				2.30



Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

Means followed by the same letter(s) in the same column for each factor are not significantly different at $P \leq 0.05$ using Duncan Multiple Range Test (DMRT).

Table 2 shows that the effect of irrigation on seed germination rate was significant at 4, 6, 8 and 16 WAS, mulching effect was significant at 0, 8 and 12 WAS while varietal effect was only insignificant at 2, 14 and 16 WAS ($P \leq 0.05$). Faster germination were obtained under 4 days irrigation interval at all storage periods except at 10 and 16 WAS. However, the differences between it (4 days irrigation interval) and the slowest seed were only significant at 4, 6 and 8 WAS. Seed germinated faster under no mulch condition than when the plots were mulched, but the differences were only significant at 0, 8 and 12 WAS. The significant differences that existed among varieties did not follow any consistent trend throughout the storage period. Seeds generally germinated faster within the first 4 weeks and slower at about 8 WAS. There was no significant interaction among the different factors. The interaction effects of I x M, I x V and M x V were not significant.

Table 3 shows that seeds produced at 4 days irrigation interval generally had the highest seedling emergence except at 4 WAS, while those produced at 8 days irrigation interval were generally the poorest. However, the differences between 4 and 6 days irrigation interval were insignificant at 0, 2, and 4 WAS, while the differences between 2 and 4 days irrigation interval was significant at 8 and 10, 14 and 16 WAS. Superiority of mulching was only recorded at 4, 12 and 14 WAS. The varietal effect on seedling emergence was significant almost throughout the storage period except at 0, 4 and 6 WAS. As from 8 WAS of storage, the highest emergence scores were recorded in Roma VF. The interaction effect between irrigation interval and mulching on seedling emergence was significant at 4 and 8 weeks (Table 4). Mulching of the mother plant under 2 and 4 days irrigation intervals resulted in the production of seeds that gave higher seedling emergence following 4 WAS (Figure 1); such trend was not recorded in seeds produced under other irrigation intervals of 6 and 8 days. Also, mulching resulted in superior seedling emergence following 8 WAS when the mother plants were subjected to 4, 6 and 8 days irrigation intervals; the reverse was the case under 2 days irrigation interval (Figure 2).



Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

Table 3: Effect of irrigation interval, mulching and variety on tomato seed germination rate (days)

Factors	Storage period (weeks)							
	8	10	12	14	0 16	2	4	6
<u>Irrigation interval (I)</u>								
2 days		4.20a	4.66a	4.52b	6.31ab	7.86a	6.53a	
7.03a	6.45a	6.94a						
4 days		4.13a	4.44a	4.41b	5.88c	7.11b	6.36a	
6.52a	6.11a	6.09ab						
6 days		4.26a	4.53a	4.65ab	6.47a	7.34ab	6.48a	6.97a
6.44a	6.39ab							
8 days		4.17a	4.61a	4.79a	6.04bc	7.27b	6.34a	
6.58a	6.56a	5.72b						
<u>Mulching (M)</u>								
Mulch		4.30a	4.56a	4.65a	6.31a	7.79a	6.44a	
7.06a	6.41a	6.35a						
No mulch		4.08b	4.55a	4.54a	6.05a	7.00b	6.42a	
6.48b	6.37a	6.22a						
<u>Tomato varieties (V)</u>								
Roma VF		4.51a	4.47a	4.85a	5.98b	6.66c	7.08a	
6.82ab	6.11a	6.04a						
Ibadan local		4.14b	4.67a	4.68ab	6.30ab	7.49b	6.03b	6.35b
6.46a	6.52a							
Ife 1		4.52a	4.53bc	5.91b	7.24bc	6.49ab	7.27a	6.39a
3.98b	4.52a							6.82a
UC82B		4.14b	4.31c	6.53a	8.21a	6.11b	6.66ab	6.61a
4.14b	4.57a							
5.75a								
<u>Interaction</u>								



ISSN: 2346-7371 (PRINT)
2682-4965(ONLINE)

Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

I x M	NS	NS	NS	NS	NS	NS	NS	NS
NS	NS							
I x V	NS	NS	NS	NS	NS	NS	NS	NS
NS	NS							
M x V			NS	NS	NS	NS	NS	NS
NS		NS	NS					
I x M x V		NS	NS	NS	NS	NS	NS	NS
NS	NS	NS						

Means followed by the same letter(s) in the same column for each factor are not significantly different at $P \leq 0.05$ using Duncan Multiple Range Test (DMRT). NS = Not significant



Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

Table 4: Effect of irrigation interval, mulching and variety on tomato seedling emergence percentage

Factors	Storage period (weeks)							
	8	10	12	0	2	4	6	
<u>Irrigation interval (I)</u>								
2 days			82ab		90ab	83a	85a	58b
	44b	22a	03b	02b				
4 days			87a		95a	85a	83a	80a
	54a	23a	06a	04a				
6 days			80ab		86ab	85a	70b	50c
	35b	12b	01c	01c				
8 days			77b		83b	70b	68b	50c
	29c	10b	01c	01c				
<u>Mulching (M)</u>								
Mulch			95a		81a	78a	75a	57a
	42a	20a	06a	03a				
No mulch			80a		79a	73b	73a	55a
	39a	16b	03b	02a				
<u>Tomato varieties (V)</u>								
Roma VF			84a		79ab	75a	78a	68a
	45a	30a	04a	02a				
UC82B				83a		75b	75a	73a
	56ab	35b	10c	02b	01b			
Ibadan local			88a		87a	74a	75a	56ab
	41ab	20b	03ab	02a				
Ife 1				83a		77ab	77a	75a
	53b	40ab	19b	03ab	01b			
<u>Interaction</u>								



ISSN: 2346-7371 (PRINT)
2682-4965(ONLINE)

Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

I x M			NS		NS		*		NS	*
NS	NS		NS	NS						
I x V				NS		NS		NS	NS	NS
NS	NS		NS		NS					
M x V					NS	NS		NS	NS	NS
NS	NS		NS		NS					
I x M x V				NS		NS		NS	NS	NS
NS	NS	NS								

Means followed by the same letter(s) in the same column for each factor are not significantly different at $P \leq 0.05$ using Duncan Multiple Range Test (DMRT), NS = Not significant. (*) Significant at 5

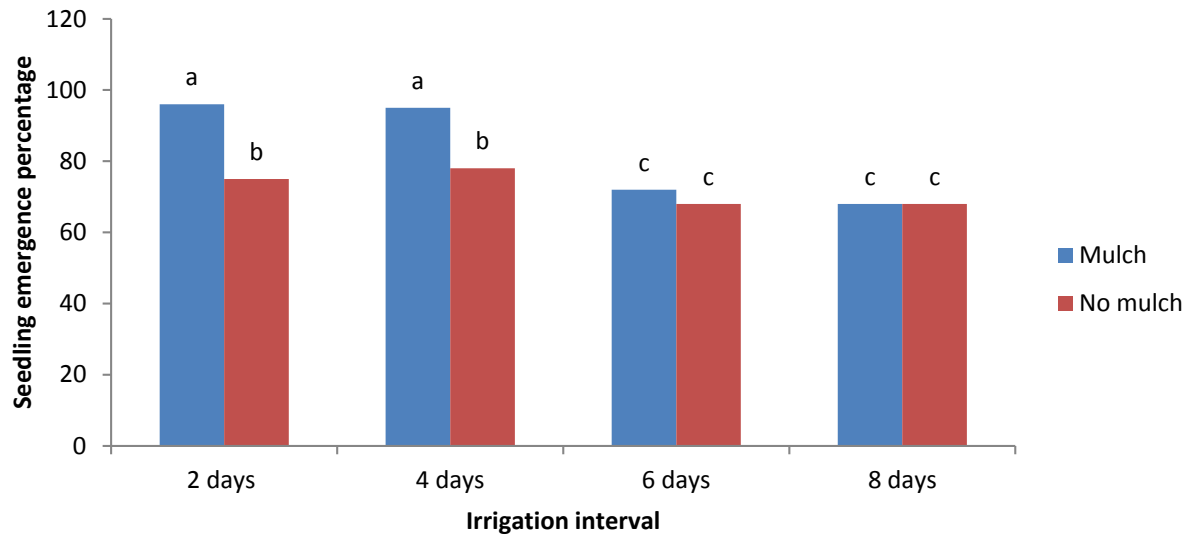


Figure 1: Interaction of mulching and irrigation interval on seedling emergence percentage at 4 WAS

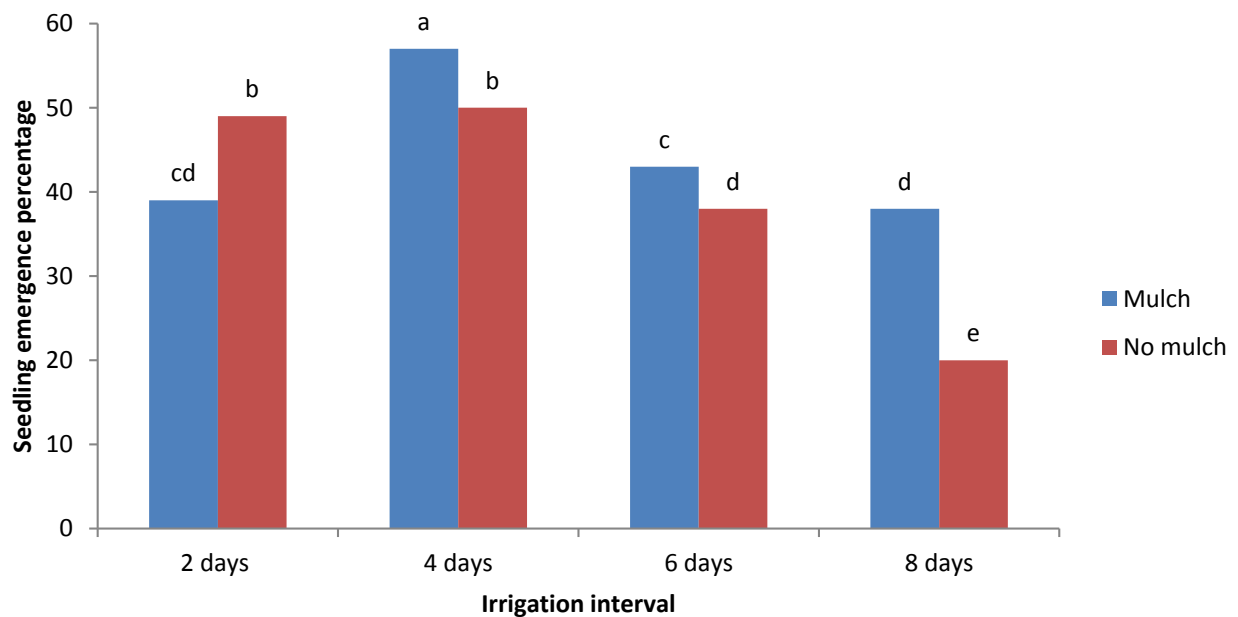


Figure 2: Interaction of mulching and irrigation interval on seedling emergence at 8 WAS



Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

Seedling emergence rate varied significantly (though with inconsistent trend) among the irrigation intervals (Table 5). Seedling emergence following seed storage at 0, 2, 4 and 6 weeks was significantly faster from seed produced by mulched plants than from those that were unmulched. The superiority of mulched over unmulched treatment however were absent as from 8 WAS. Though significant differences were recorded among varieties, the trend varied with storage period.

Seedling height was significantly affected by irrigation interval, mulching and variety (Table 6). Irrigation intervals of 2 and 4 days gave the best performance compared to what was obtained at 6 and 8 interval. Seedlings from seeds produced from mulched plants were only significantly taller than those from unmulched plants at 4, 6 and 10 WAS, no significant differences were recorded for the other seed ages. Though there were significant differences in seedling height among varieties, the trend was not consistent over storage periods. Within the first six weeks of storage, there was a general increase in seedling height which was followed by a decline. For instance, Roma VF seedling height increased from about 7.8 cm at zero WAS to about 24.5 cm at 6 WAS. Similarly that of UC82B increased from about 8.1 cm to about 20.1 cm during the same period. However, from 8 to 14 WAS, UC82B seedlings were significantly generally taller than those of other seedlings. Across the storage period, the average seedling height of Ife 1 was 11.40 cm as against 13.80 cm for each of the other varieties. The interaction effect of irrigation interval and variety on seedling height was significant at 0, 4, 6, 8 and 10 WAS

Figure 3 shows that Roma VF seedlings were taller than those of other varieties at all the irrigation intervals. However, the differences between its seedlings and those of Ibadan Local and Ife 1 were insignificant at 2 days irrigation interval. Similarly, where seedling height of Roma VF and UC82B was similar at 2 days irrigation interval, Roma VF seedling were significantly taller than those of other tomato varieties when seeds were produced at 4, 6 and 8 days irrigation intervals. Furthermore, whereas Ibadan Local and Ife 1 seedling were similar in length for seeds produced under 2 days irrigation intervals, seedling of former were significantly longer than those of the latter when seeds were produced under 4, 6 and 8 days irrigation intervals.



Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

Figure 4 on the other hand shows that Roma VF seedlings were taller than those of other varieties at 4, 6 and 8 days irrigation intervals. However, the differences between its seedlings and that of UC82B were not significant at 2 days irrigation interval. The seedlings of Ibadan Local were significantly taller than those of UC82B and Ife 1 produced at 6 and 8 days irrigation interval but similar to those of Ife 1 at 2 days irrigation interval.

Significantly more leaves were generally produced by seedling obtained from 2 and 4 days irrigation interval than from 6 and 8 days irrigation interval (Table 7). Mulching was superior to non-mulching at 2, 4 and 14 WAS. At 8 WAS UC82B produced significantly greater leaf numbers than other varieties. There were general increases in leaf number from 2 to 6 WAS and followed by decline thereafter.

The interaction effect of variety and mulching on number of leaves per seedling was significant at 6 and 8 weeks after storage (Table 7). At 6 WAS, Roma VF seedlings from seeds produced under no mulch condition produced significantly more leaves (13.17) than those from seeds produced under mulching (12.17) while the opposite was the case for Ife 1 in mulched and unmulched conditions respectively; mulching effect was insignificant in UC82B and Ibadan local (Figure 5). At 8 WAS, Roma VF, UC82B and Ife 1 seedlings from seeds of mulched environment were superior (10.83, 14.50 and 12.42 respectively) to those from the unmulched (10.00, 12.92 and 9.67 respectively). Mulching did not have a significant effect in Ibadan local (Figure 6).



Table 5: Effect of irrigation interval, mulching and variety on tomato seedling emergence rate (days)

Factors	Storage period (weeks)							
	8	10	12	14	0	2	4	6
<u>Irrigation interval (I)</u>								
2 days				6.16ab 6.02a	5.67a	5.57c	6.19b	5.79ab 6.19a
	5.31ab							
4 days				6.09b	6.21a	5.78a	5.61c	6.18b 5.99a
	6.07a	5.53a						
6 days				6.14ab 6.21a	5.71a	6.25b	6.56a	5.76ab 6.33a
	4.62ab							
8 days				6.34a	5.72b	5.91a	6.67a	6.75a 5.50b
	6.17a	4.21b						
<u>Mulching (M)</u>								
Mulch				6.04b	5.91b	5.67b	5.87b	6.33a 5.71a
	6.27a	5.04a						
No mulch				6.33a	6.16a	5.87a	6.18a	6.49a 5.82a
	6.11a	5.79a						
<u>Tomato varieties (T)</u>								
Roma VF				6.62a	6.02a	5.63b	5.94b	6.90a 5.63b
	6.21ab 6.04a							
UC82B				6.08b	6.04a	5.97a	6.20a	6.38b 6.29a
	5.97b	3.61c						
Ibadan local			6.09b	5.96a	5.48b	5.94b	6.30bc 5.54b	6.16ab 5.39ab
Ife 1				5.94b	6.14a	5.98a	6.03ab 6.09c	5.59b
	6.41a	4.61bc						
<u>Interaction</u>								



ISSN: 2346-7371 (PRINT)
2682-4965(ONLINE)

Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

I x V		NS	NS	NS	NS	NS	NS	NS	NS
NS									
M x I		NS	NS	NS	NS	NS	NS	NS	NS
NS									
M x V			NS	NS	NS	NS	NS	NS	NS
NS	NS								
V x M x I		NS	NS	NS	NS	NS	NS	NS	NS
NS									

Means followed by the same letter(s) in the same column for each factor are not significantly different at $P \leq 0.05$ using Duncan Multiple Range Test (DMRT). NS = Not significant.



ISSN: 2346-7371 (PRINT)
2682-4965(ONLINE)

Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

Table 6: Effect of irrigation interval, mulching and variety on tomato seedling height at four weeks after sowing

Factors	Storage period (weeks)												
	8	10	12	14	0	16	2	4	6				
<u>Irrigation interval (I)</u>													
2 days			8.15b		14.93a	20.73a	23.24a	18.16b	16.70a	11.85b	10.40a	5.89ab	
4 days			9.89a		15.97a	20.60a	22.58a	19.72a	17.19a	12.74a	9.84a		6.63a
6 days			6.09c		12.33b	16.77b	19.08b	15.12c	14.18b	12.28ab	8.03b		5.09b
8 days			6.86c		11.79b	16.40b	17.77c	14.55c	13.00c	10.67c	8.59b		5.56b
<u>Mulching (M)</u>													
Mulch			8.92a		14.14a	19.13a	21.24a	17.26a	15.17a	12.10a	8.06a		5.03a
No mulch			7.84a		13.68a	18.10b	20.11b	16.52a	14.07b	11.63a	7.92a		5.12a
<u>Tomato varieties (V)</u>													
Roma VF			7.80a		15.72a	22.07a	24.54a	14.48c	13.40c	10.73c	9.25a		6.00a
UC82B			8.11a		13.65b	15.40c	20.07b	20.00a	19.22a	14.72a	9.38a		4.02c
Ife 1		8.07a	13.15b	15.84c	16.78c	14.45c	12.74c	9.12d		7.13b		5.41bc	
Ibadan local			7.11b	14.79a	21.01b	21.30b	17.89b	15.73b	12.99b	7.99b		5.41b	
<u>Interaction</u>													
I x M		NS	NS		NS		NS		NS	NS		NS	NS
I x V		*	NS	*		*		*		*		NS	NS
M x V			NS		NS		NS		NS		NS		NS
NS	NS		NS										
I x M x V		NS	NS		NS		NS	NS		NS		NS	NS

Means followed by the same letter(s) in the same column for each factor are not significantly different at $P \leq 0.05$ using Duncan Multiple Range Test (DMRT), NS = Not significant. (*) Significant at 5 %

Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

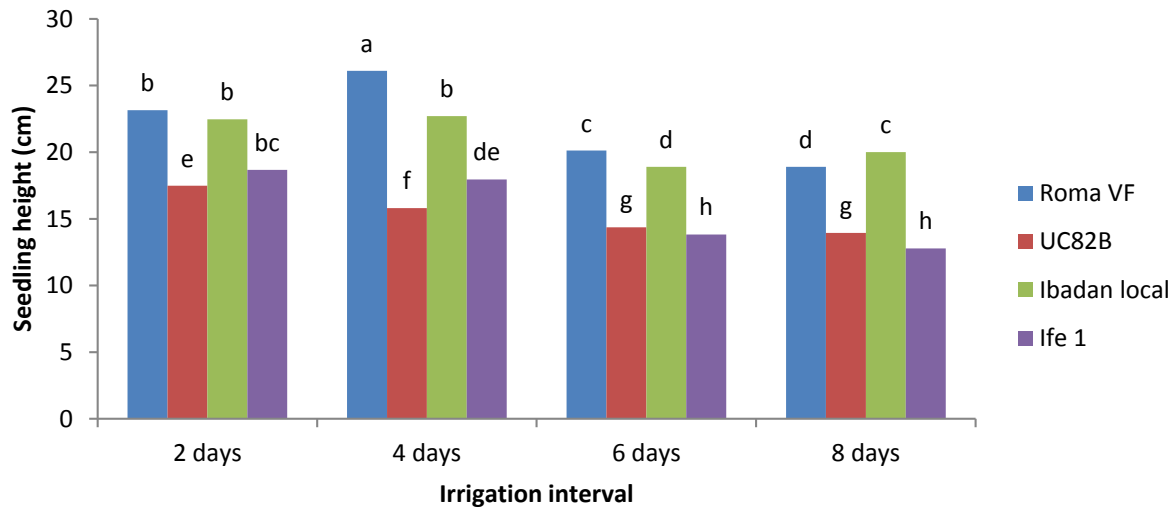


Figure 3: Interaction of irrigation interval and variety on seedling height four weeks after planting following four weeks of storage.

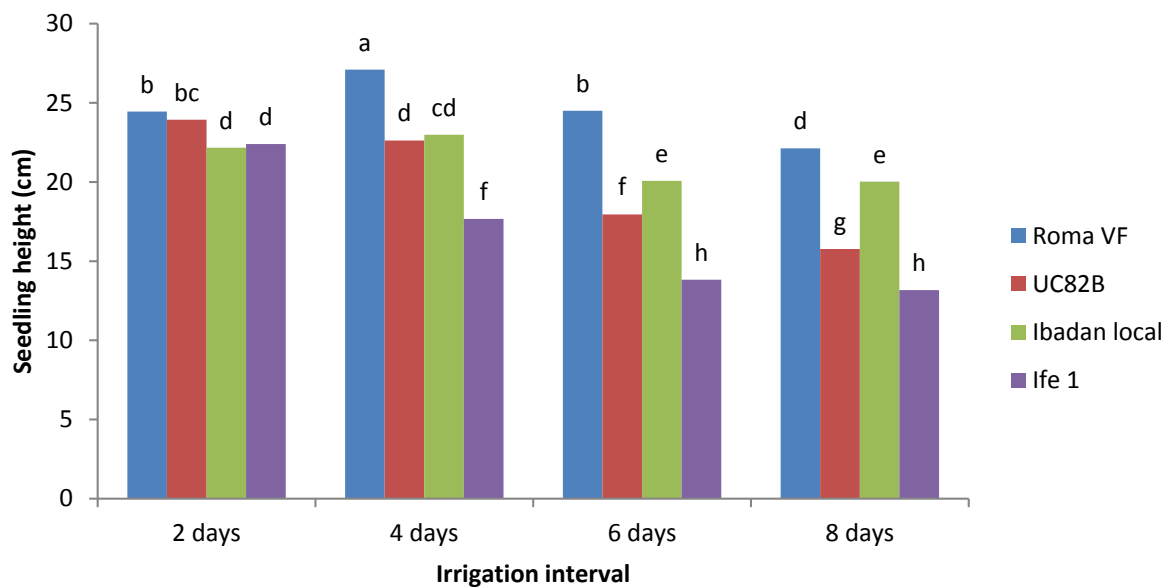


Figure 4: Interaction of irrigation interval and variety on seedling height four weeks after planting following six weeks of seed storage.



Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

Table 7: Effect of irrigation interval, mulching and variety on number of leaves per seedling at four weeks after sowing

Factors	Storage period (weeks)								
	8	10	12	0	2	4	6		
<u>Irrigation interval (I)</u>									
2 days			5.09b	8.70b	11.34b	14.08a	13.69a	10.63a	8.00ab
	6.71a	4.89a							
4 days			6.66a	10.99a	12.99a	14.21a	12.17b	10.83a	8.67a
	6.79a	4.75a							
6 days			5.50b	7.60c	11.08bc	12.46b	10.00c	8.96b	
	7.85b	5.50b	4.68a						
8 days			4.16c	7.25c	10.00c	11.63b	9.50d	7.87c	
	7.00c	5.29b	3.02b						
<u>Mulching (M)</u>									
Mulch			5.88a	9.75a	11.99a	13.09a	12.33a	9.45a	
	7.92a	7.19a	4.03a						
No mulch			5.66a	7.88b	10.00b	12.79a	11.93a	9.39a	
	7.87a	5.95b	4.44a						
<u>Tomato varieties (T)</u>									
Roma VF			6.39a	7.83b	10.22c	12.67a	10.40c	7.80c	
	7.53b	6.00b	4.05b						
UC82B			5.54b	9.17a	11.25bc	13.92a	13.79a	12.62a	
	11.08a	8.04a	5.87a						
Ibadan local			6.27a	8.92a	13.54a	13.62a	11.87b	8.88b	7.38b
	5.29c	2.75c							
Ife 1			4.05c	7.95b	10.37c	12.17b	11.04bc	9.17b	
	6.18c	4.96c	4.25b						



ISSN: 2346-7371 (PRINT)
2682-4965(ONLINE)

Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

Interaction

I x M		NS	NS	NS	NS		NS	NS
	NS		NS	NS				
I x V		NS	NS	NS	NS		NS	NS
	NS		NS	NS				
M x V			NS	NS	NS	*	*	
NS	NS		NS	NS				
I x M x V		NS	NS	NS	NS	NS	NS	NS
	NS		NS	NS				

Means followed by the same letter(s) in the same column for each factor are not significantly different at $P \leq 0.05$ using Duncan Multiple Range Test (DMRT), NS = Not significant. (*) Significant at 5 %

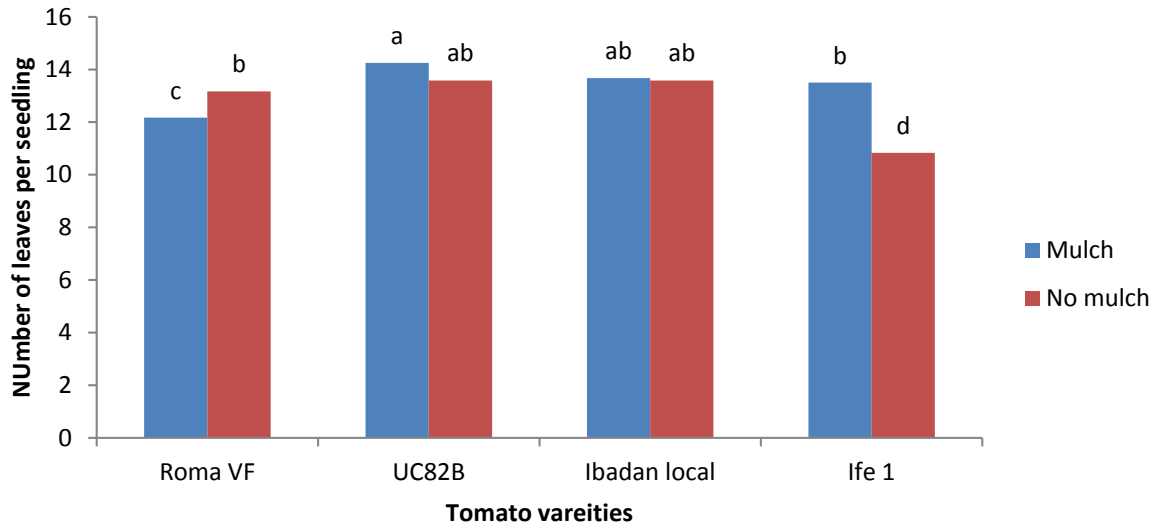


Figure 5: Interaction of variety and mulching on number of leaves per seedling four weeks after planting following seed storage at 6 WAS

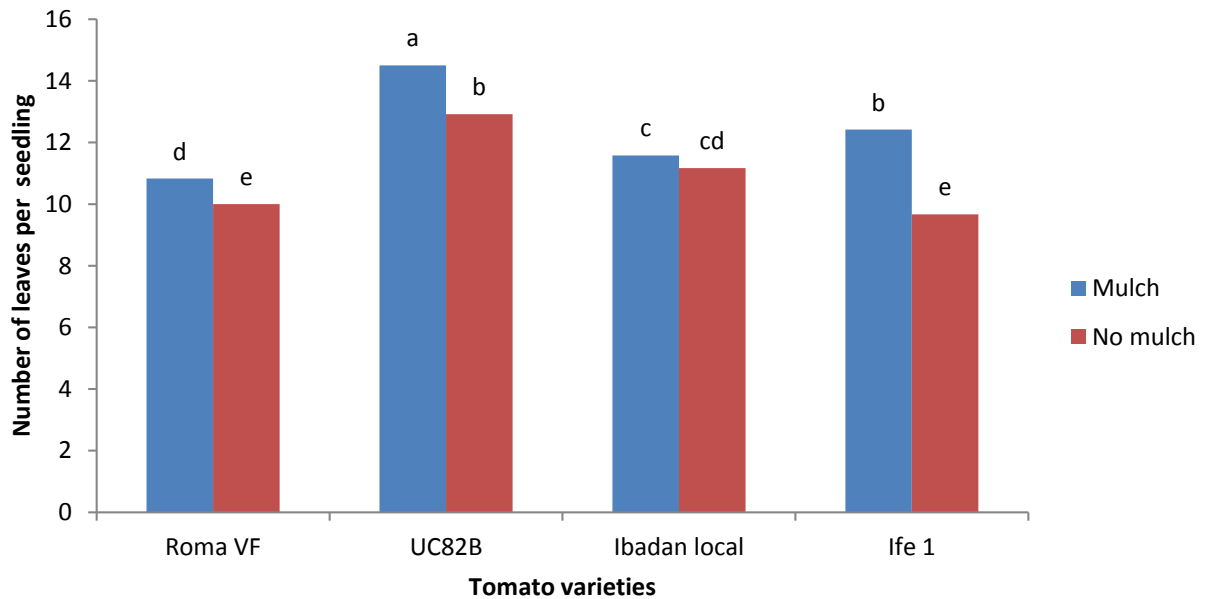


Figure 6: Interaction of variety and mulching on number of leaves per seedling four weeks after planting following seed storage at 8 WAS



DISCUSSION

Irrigation interval did not have a consistent effect on seed germination percentage within the first eight weeks of storage in this study. However, the significant poorer germination of seeds produced under 8 days irrigation interval compared to the values obtained at closer intervals agrees with the work of Younesi and Moradi (2009) which showed that water limitation during growth and development of plants affects subsequent seed quality. Water deficit during dill (*Anethumgraveolens* L.) seed filling has also been reported to reduce seed quality by Zehtab-Salmasiet *al.*(2006). Dormancy is known to occur in some varieties of tomato and it has been reported to be caused by abscisic acid (Hillhorst and Downie, 1996). The varietal difference displayed in this study in respect of seed germination and seedling emergence might be due to inherent genetic differences. Sabongari and Aliero (2004) recorded differences in the emergence of seedlings of different tomato varieties. Nooriet *al.*(2007) reported similar observation with canola cultivars under less irrigation in podding stage. Generally, there were decline in germination and seedling emergence percentages with seed ageing. This is in agreement with Palm *et al.* (1995) who observed that as age of *Acacia senegalensis* seed increased, seed germination percentage reduced. The varietal difference in seedling emergence might be due to inherent genetic difference. Soltaniet *al.*(2009) has reported loss in germination capacity as the final manifestation of seed deterioration and that, during ageing seeds lose their vigour and ultimately viability.

The initial improvement in seedling height and the number of leaves per plant as storage progressed in this study may have been due to the depletion of whatever factor that might have imposed limitation to seedling growth with time. According to Chetriet *al.*(1993), ageing slows growth rate and would have affected plant height and plant biomass. The significant effect of irrigation interval, mulching and variety on seed germination and seedling emergence which was conspicuously displayed at the beginning of the storage became inconspicuous as the storage progressed. Tomato seeds generally germinated faster within the first four weeks after storage and slower as from about eight weeks after storage. This could be attributed to decline in vigour



Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

which is associated with seed age (Ibrahim *et al.*, 2011) and it may probably be due to reduction in germination energy that is known to decline as seed ages (Bukvic*et al.*, 2007).

In conclusion, irrigating tomato at 8 days irrigation interval resulted in poor seed germination. There were decline in seed germination and seedling emergence percentage as the seed ages.

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