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Safflower genotypes and time of picking flores influenced mineral and proximate variables

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Abstract
Safflower thrives in regions which are mostly characterized by water deficit, salinity, and infertile soils. The capability of safflower to withstand abiotic stresses and its multipurpose uses makes this crop important for food sufficiency and nutritional security, and to mitigate and adapt to climate change in arid and semi-arid lands (ASALs). Micronutrient deficiencies have become a serious worldwide predicament especially in ASALs where diets lack variety. The objective of this study was to explicate how safflower genotypes and time of picking flores may affect mineral content and proximate variables of flores. The results indicated that there was significant (p<0.05) genotypic and time of picking on mineral content and proximate variables of safflower flores. The safflower flores mineral contents ranged between 423-524 (Ca), (258-306 (Mg), 2214-2328(K), 195-250(Na), 10.3-20.2 (Fe), 1.4-2.7 (Zn) mg/100g depending on genotype, time of harvest, and season of planting Proximate variables ranged between 74.9-80.3, 2.9-4.6, 1.0-2.8, 2.5-3.4, 5.2-8.6 and 3.8-10.1% for moisture, crude fibre, crude protein, fat, ash and carbohydrate contents, respectively depending on genotype, time of harvest, and season of planting. Safflower flores mineral and proximate variables contents indicated genotype and environment interaction. The results revealed that ground safflower flores can be added to foods during cooking, smoothies or taken as herbal tea as food supplement for the supply of Ca, Mg, K, Na and Zn apart from other health benefits especially in the ASALs where diet variety is limited. In conclusion the spineless genotype Turkey was excellent for high mineral content. The optimum time for safflower flores to be picked to optimize both mineral and proximate variables contents was inconclusive.

Keywords: *Carthamus tinctorius* L., flores nutritional content, food supplement, nutrition security

1. Introduction

Safflower can be grown successfully in regions experiencing low and mild temperatures in winter and spring, respectively [1-3] and in arid and semiarid lands (ASALs) where water scarcity is a common phenomenon due to its xerophilic nature and salinity tolerance [3-12]. Safflower flores are used for numerous culinary and textile purposes, cut flowers, colouring cosmetics, foods and pharmaceuticals, herbal teas, manufacture of pharmaceuticals, and treatment of several human ailments [9, 13-19]. The flores of safflower contain several beneficial substances and many of them have been identified [20-21]. Literature reports that safflower flores contain 1-3% crude protein, 3-4.8% fat content, 3-11.6% crude fibre, 4-10% carbohydrate, 5-10.8% ash content, and 4-4.7% moisture content [22-23]. The flores further contain flavonoids, essential oils, alkaloids, corticosteroids, lignans, carboxylic acids, acetylene polymers, alkane diols for cosmetic preservation, and vitamin B2 [14, 20-21, 24-29]. The mineral composition of safflower flores reported in literature include calcium (Ca) 530-708, iron (Fe) 5.5-55.1, magnesium (Mg) 142-207, potassium (K) 2040-3992, copper (Cu) 1.10-4.73, sodium (Na) 17.0-1043, and zinc (Zn) 2.6-2.88 mg/100g [23, 30-34]. These mineral elements are essential for human health [35-36]. Mineral elements in their natural sources are more bioavailable and have higher biological activity than their synthetic analogues [31, 37-39]. Therefore, it implies that safflower flores can be used as a natural mineral source apart from other health benefits [14, 20-21, 24-27]. The objective of this study was to explicate how safflower genotypes and time of picking flores may affect the mineral and proximate variables contents of flores.

2. Materials and Methods
2.1 Study Location
Two experiments were undertaken in Sebele, Botswana, BUAN Content Farm located at latitude 59º24'S and longitude 95º25'E, in 2021 and 2022. The study location has sandy loam soils with mean yearly precipitation and evapotranspiration of 425 and 2400 mm, respectively [40, 41].

2.2 Experimental Design
The experimental design was a split-plot replicated three times. Three safflower genotypes (Sina, Kenya-9819, Turkey) and four times of picking flores (onset of flowering, full bloom, post-pollination, and end of flowering when petals have wilted) were randomly allocated to main and sub-plots, respectively. Each sub-plot and main plot had an area of 9 and 70 m^2, respectively.

2.3 Agronomic Practices
Both primary and secondary cultivation was done in the study plots. Nitrogen and phosphorus at 80 and 30 kg ha^{-1}, respectively was applied as basal dressing. The spacing was 40 cm (between rows) x 25 cm (between plants) and seeds planted at a depth of 4.5 cm. Weed management was done manually by hoeing between rows and within plants when necessary. In the absence of rainfall, supplementary irrigation was done using sprinklers for two hours to a depth of 11 mm.

2.4 Data Collection
Safflower moisture, crude protein, crude fibre, fat, carbohydrate, and mineral contents were determined using established protocols of AOAC [42].

2.5 Data Analysis
Analysis of variance (ANOVA) was undertaking on the data collected. Where a significant Fisher test was found, treatment means were separated using the Least Significant Difference (LSD) at $p<0.05$.

3. Results
In all the variables determined there was no significant ($p>0.05$) difference in genotype and harvest time of safflower flores. Therefore, only main effects are reported.

3.1 Calcium
Significant ($p<0.05$) genotypic variation and time of picking safflower flores on calcium (Ca) content was recorded (Table 1). The genotype Turkey had flores Ca content of 517.18 and 511.5 mg/100 g in summer and winter, respectively which was significantly ($p<0.05$) higher than that of other genotypes under investigation (Table 1). There was significant ($p>0.05$) variation in the flores Ca contents of genotypes Sina and Kenya-9819 (Table 1). The mean safflower flores Ca content was 457 mg/100 g as influenced by time of picking and genotype. Safflower flores picked at the end of flowering had higher ($p<0.05$) Ca content of 523.91 and 520.19 mg/100 g in summer and winter, respectively than other picking times (Table 1). On the contrary, safflower flores picked at the onset of flowering had lower ($p<0.05$) Ca content of 427.25 and 421.99 mg/100 g in safflower grown in summer and winter, respectively (Table 1).

3.2 Magnesium
Time of picking safflower flores had a significant ($p<0.05$) influence on Mg content but genotypes had no variation (Table 1). The flores picked at full bloom had the highest ($p<0.05$) Mg contents of 305.76 and 298.13 mg/100g in safflower planted in summer and winter, respectively compared to other picking times (Table 1). The lowest safflower flores Mg content of 260.44 and 257.74 mg/100g in summer and winter, respectively was on flores picked at the end of flowering (Table 1).

3.3 Potassium
Safflower genotypes and flores picking time significantly ($p<0.05$) influenced flores potassium (K) content (Table 1). Flores from genotype Turkey had K contents of 2327.88 and 2313.80 mg/100g in summer and winter grown safflower, respectively which was significantly ($p<0.05$) higher than that of other genotypes (Table 1). The flores from genotypes Sina and Kenya-9819 had no statistical ($p>0.05$) variation with respect to their K contents (Table 1). The flores K contents ranges were 2227.21-2327.88 and 2214.73-2313.80 mg/100 g in summer and winter grown safflower, respectively as influenced by genotype (Table 1). Safflower flores picked at full bloom had K contents of 2327.88 and 2313.80 mg/100 g in summer and winter grown safflower plants, respectively which was statistically ($p<0.05$) higher than that of other picking times (Table 1). Safflower flores picked at the onset of flowering had lower K contents of 2232.40 and 2217.97 mg/100 g in safflower grown in summer and winter, respectively than that of other picking times (Table 1). The mean safflower flores K contents in summer and winter were 2261.06 and 2247.64 mg/100 g, respectively (Table 1).

Table 1: Influence of genotype and time of flores picking on safflower flores calcium, magnesium, and potassium contents

Treatments	Calcium (mg/100 g)		Magnesium (mg/100g)		Potassium (mg/100g)	
	Summer	Winter	Summer	Winter	Summer	Winter
Genotypes						
Sina	431.37b	427.30b	279.32a	277.16a	2227.21b	2214.46b
Kenya-9819	430.91b	424.10b	278.91a	275.10a	2228.06b	2214.73b
Turkey	517.18a	511.05a	277.52a	273.38b	2327.88a	2313.80a
Significance	***	***	NS	NS	***	***
LSD	3.163	3.898	6.441	3.847	1.582	2.497
Picking times						
Onset of flowering	427.25d	421.99d	276.13b	274.30b	2232.40d	2217.97d
Full bloom	437.99c	430.86c	305.76a	298.13a	2283.16a	2269.29a
Post-pollination	450.12b	443.55b	271.99c	270.69c	2275.16b	2261.82b
End of flowering	523.91a	520.19a	260.44d	257.74d	2253.53c	2241.49c
Significance	1.979	2.362	3.946	3.524	1.706	2.494
LSD	***	***	***	***	***	***

*, **, ***. Significant at 0.05, 0.01, 0.001, respectively. Means separated using the Least Significant Difference (LSD) at $p<0.05$, means within column followed by the same letter(s) are not significantly different

3.4 Sodium
There was no genotypic variation of sodium (Na) in safflower, but time of picking did ($p<0.05$) (Table 2). Flores picked at full bloom had Na contents of 249.84 and 246.45 mg/100 g in summer and winter grown safflower, respectively which was higher than that of other picking times (Table 2). Flores picked at the onset of flowering had Na content of 199.16 and 195.13 mg/100 g in summer and winter grown safflower, respectively which statistically ($p<0.05$) was lower than that of other picking (Table 2). Safflower flores picked at post-pollination had higher Na content than those picked at the end of flowering (Table 2).

3.5 Iron
There was significant ($p<0.05$) genotypic and time of flores picking variation on flores iron (Fe) content (Table 2). Flores Fe contents of 16.93 and 14.65 mg/100 g in summer and winter grown safflower, respectively was observed in the genotype Turkey, which was significantly ($p<0.05$) higher than that of other genotypes (Table 2). There was no significant ($p>0.05$) genotypic variation in the flores Fe contents of genotypes Sina and Kenya-9819 (Table 2). Safflower grown in summer had higher flores Fe content of 15.57 mg/100 g than winter grown which had flores Fe content of 12.86 mg/100 g irrespective of genotype (Table 2). Safflower flores picked at the end of flowering had Fe contents of 20.23 and 15.98 mg/100 g in summer and winter grown safflower, respectively which was significantly ($p<0.05$) higher than that of other picking times (Table 2). Flores picked at the onset of flowering had Fe contents of 11.87 and 10.32 mg/100 g in summer and winter grown safflower, respectively which was significantly ($p<0.05$) lower than that of other picking times (Table 2). Safflower flores picked at post-pollination had higher Fe content than those picked at full bloom (Table 2).

3.6 Zinc
Significant ($p<0.05$) genotypic and time of picking of safflower flores with respect to zinc (Zn) content was observed in the current study (Table 2). The flores Zn content of the genotype Kenya-9819 was 2.65 mg/100 g in summer grown safflower which was significantly ($p<0.05$) greater than that of other genotypes (Table 2). There was no genotypic variation in the flores Zn contents of genotypes Sina and Turkey in summer (Table 2). There was no genotypic variation of safflower flores in plants grown in winter (Table 2). Summer grown safflower had flores Zn content of 2.2 mg/100g which was greater than 1.81 mg/100g from, flores of winter grown safflower (Table 2). Safflower flores picked at the onset of flowering had Zn contents of 2.66 and 2.05 mg/100g in summer and winter grown safflower, respectively which was greater than that of other picking times (Table 2). Safflower flores picked at the end of flowering had Zn contents of 1.74 and 1.41 mg/100g in summer and winter grown plants, respectively which were the lowest compared to other picking times (Table 2). Delaying flores picking time decreased Zn content (Table 2).

Table 2: Influence of genotype and time of flores picking on safflower flores sodium, iron, and zinc contents.

Treatments	Sodium (mg/100g)		Iron (mg/100g)		Zinc(mg/100g)	
	Summer	Winter	Summer	Winter	Summer	Winter
Genotype						
Sina	227.17a	224.96a	15.00b	11.82b	2.01b	1.81a
Kenya-9819	228.06a	225.23a	14.79b	12.10b	2.65a	1.82a
Turkey	227.97a	224.30a	16.93a	14.65a	1.94b	1.81a
Significance	NS	NS	***	***	***	NS
LSD	1.373	2.496	0.602	0.833	0.127	0.026
Picking time						
Onset of flowering	199.16d	195.13d	11.87d	10.32d	2.66a	2.05a
Full bloom	249.84a	246.45a	14.22c	11.48c	2.30b	1.94b
Post-pollination	241.86b	238.99b	15.99b	13.60b	2.09c	1.85c
End of flowering	220.08c	218.75c	20.23a	15.98a	1.743d	1.413d
Significance	***	***	***	***	***	***
LSD	1.687	2.494	0.488	0.581	0.130	0.025

*, **, ***. Significant at 0.05, 0.01, 0.001, respectively. Means separated using the Least Significant Difference (LSD) at $p<0.05$, means within column followed by the same letter(s) are not significantly different

3.7 Moisture
Significant ($p<0.05$) genotypic variation with respect to flores petal moisture content (MC) was observed in this study (Table 3). The safflower genotype with the greatest flores MC at picking time was Turkey which had MC of 78.66 and 80.28% in summer and winter, respectively (Table 3). Time of flores picking had a significant ($p<0.05$) effect on MC (Table 3). Safflower flores picked at post-pollination had the highest MC compared to other picking times (Table 3). Furthermore, safflower flores from plants grown in summer had lower MC than winter grown plants (Table 3).

3.8 Crude fibre
There was genotypic and time of picking variation on safflower flores crude fibre (CF) content (Table 3). The CF content of the genotype Turkey was 4.54 and 4.64% in summer and winter grown plants, respectively which was higher than that of other genotypes (Table 3). The lowest flores CF contents of 2.87 and 2.98% in summer and winter grown plants, respectively was recorded in the genotype Kenya-9819. Picking safflower flores at post-pollination had the highest CF content in both summer and winter grown plants (Table 3). Safflower flores harvested at the onset of flowering and full bloom did not statistically ($p>0.05$) vary in their CF contents (Table 3). Similarly, flores picked at post-pollination and end of flowering had no statistical ($p>0.05$) variation in their CF contents (Table 3).

3.9 Crude protein
Significant ($p<0.05$) genotypic and time of picking safflower flores variation on crude fibre (CF) content was observed in the current study (Table 3). Genotype Turkey had the highest

CP content of 1.79 and 2.80% in safflower plants grown in summer and winter, respectively (Table 3). On the contrary, the flores of genotype Kenya-9819 had the lowest CP content of 1.00 and 2.00% in safflower plants grown in summer and winter, respectively (Table 3). Safflower flores picked at post-pollination and end of flowering had the highest CP content than other picking times (Table 3). Safflower flores picked at the onset of flowering had significantly (p<0.05) higher CP content than those picked at bloom (Table 3).

3.10 Fat
In summer and winter grown safflower, genotype and time of flores harvest influenced flores fat content (FC) (Table 4). The genotype Turkey had the flores FC of 3.35 and 3.39% for safflower grown in summer and winter, respectively (Table 4). While the genotype Sina had the second highest FC of 2.89 and 2.93% for safflower grown during summer and winter, respectively (Table 4). Safflower flores picked at post-pollination had the highest FC followed by flores picked at the end of flowering compared to other picking times depending on growing season (Table 4).

3.11 Ash
Significant (p<0.05) genotypic variation was observed in the current study with respect to safflower flores ash content (AC) (Table 4). The genotype Kenya-9819 had the highest AC of 8.63% for summer grown safflower but for winter grown safflower, the genotype Sina had the highest flores AC of 7.17% (Table 4). On the contrary, the genotype Turkey had significantly (p<0.05) the lowest flores AC of 5.36 and 5.16% for summer and winter grown safflower, respectively (Table 4). Safflower flores picking time in winter grown safflower influenced AC but not in summer (Table 4). Safflower flores picked at full bloom and onset flowering did not statistically (p>0.05) vary in their AC but was high in other picking times (Table 4). The highest (p<0.05) safflower flores AC of 6.86% was on plants picked at full bloom but did not differ with AC of plants which were picked at the onset of flowering (Table 4).

3.12 Carbohydrates
Significant (p<0.05) genotypic and time of picking of safflower flores were observed in the current study with respect to flores carbohydrate content (CC) (Table 4). Genotype Kenya-9819 had the highest flores CC of 10.07 and 8.74% for safflower grown during summer and winter, respectively (Table 4). On the contrary, the genotype Turkey had the lowest CC of 6.71 and 3.75% for safflower planted in summer and winter, respectively (Table 4). Safflower flores picked at the onset flowering had the highest CC irrespective of growing season in comparison to other picking times (Table 4). The second highest CC was in safflower flores picked when plants were at full bloom (Table 4). Generally, safflower plants grown in summer produced flores with higher CC (2.07%) than winter grown as influenced by genotype (Table 4).

Table 3: Influence of genotype and time of flores picking on safflower flores moisture content, crude fibre, and crude protein contents

Treatments	Moisture (%)		Crude Fibre (%)		Crude protein (%)	
	Summer	Winter	Summer	Winter	Summer	Winter
Genotypes						
Sina	75.47b	77.09b	2.95b	3.06b	1.21b	2.21b
Kenya-9819	74.94b	76.94b	2.87b	2.98b	1.00b	2.00b
Turkey	78.66a	80.28a	4.54a	4.64a	1.79a	2.80a
Significance	*	*	*	**	*	*
LSD	2.111	2.147	0.789	0.792	0.488	0.483
Picking times						
Onset of flowering (H1)	75.06b	77.05c	3.13b	3.24b	1.04b	2.05b
Full bloom (H2)	75.78b	77.53bc	3.30b	3.41b	1.21ab	2.22ab
Post-pollination (H3)	77.49a	79.40a	3.82a	3.93a	1.50a	2.60a
End of flowering (H4)	76.56ab	78.42ab	3.56ab	3.66ab	1.47a	2.47a
Significance	*	**	*	*	*	*
LSD	1.597	1.151	0.431	0.431	0.408	0.410

Kenya-9819	2.50c	2.54c	8.63a	6.81a	10.07a	8.74a
Turkey	3.35a	3.39a	5.36b	5.16b	6.71b	3.75b
Significance	**	**	*	*	*	*
LSD	0.300	0.300	1.821	1.026	2.055	2.644
Picking times						
Onset of flowering (H1)	2.62b	2.66b	8.02a	6.75ab	10.12a	8.24a
Full bloom (H2)	2.61b	2.65b	7.75a	6.86a	9.34ab	7.33a
Post-pollination (H3)	3.31a	3.35a	6.39a	5.85b	7.38c	4.87b
End of flowering (H4)	3.09a	3.13a	7.16a	6.06b	8.17bc	6.26ab
Significance	**	**	NS	*	*	**
LSD	0.452	0.452	1.692	0.797	1.757	1.898

*, **, ***. Significant at 0.05, 0.01, 0.001, respectively. Means separated using the Least Significant Difference (LSD) at p<0.05, means within column followed by the same letter(s) are not significantly different

Table 4: Influence of genotype and time of flores picking on safflower flores fat, ash and carbohydrates contents

Treatments	Fat content (%)		Ash (%)		Carbohydrates (%)	
	Summer	Winter	Summer	Winter	Summer	Winter
Genotypes						
Sina	2.89b	2.93b	8.00a	7.17a	9.48a	7.54a

Treatments	Moisture (%)		Crude Fibre (%)		Crude protein (%)	
	Summer	Winter	Summer	Winter	Summer	Winter
Genotypes						
Sina	75.47b	77.09b	2.95b	3.06b	1.21b	2.21b
Kenya-9819	74.94b	76.94b	2.87b	2.98b	1.00b	2.00b
Turkey	78.66a	80.28a	4.54a	4.64a	1.79a	2.80a
Significance	*	*	*	**	*	*
LSD	2.111	2.147	0.789	0.792	0.488	0.483
Picking times						
Onset of flowering (H1)	75.06b	77.05c	3.13b	3.24b	1.04b	2.05b
Full bloom (H2)	75.78b	77.53bc	3.30b	3.41b	1.21ab	2.22ab
Post-pollination (H3)	77.49a	79.40a	3.82a	3.93a	1.50a	2.60a
End of flowering (H4)	76.56ab	78.42ab	3.56ab	3.66ab	1.47a	2.47a
Significance	*	**	*	*	*	*
LSD	1.597	1.151	0.431	0.431	0.408	0.410

*, **, ***. Significant at 0.05, 0.01, 0.001, respectively. Means separated using the Least Significant Difference (LSD) at $p<0.05$, means within column followed by the same letter(s) are not significantly different.

4. Discussion

4.1 Genotype and time of picking of safflower flores on minerals

The safflower genotypic flores mineral content variation observed in the results reported hereby was explained by different gene transcription and translation of the mineral elements as influenced by the environment. Safflower genotypes differ in their phenology, morphology, and physiology, which affects the source-sink strength, leading to differences in mineral availability and distribution among different plant parts [43-46]. The mineral of safflower flores ranged between 424.10-517.18, 273.38-279.32, 2214.73-2327.88, 224.3-228.06, 11.82-16.93, and 1.81-2.65 mg/100 g for Ca, Mg, K, Na, Fe, and Zn, respectively as affected by genotype and environment interaction. The results of study reported hereby agree with those of Nagaraj *et al*. [47]. Nagaraj *et al*. [47] reported that the flores of safflower on average contained 530, 287, and 7.3 mg/100 g of Ca, Mg, and Fe, respectively. Barashovets and Popova [31] in Ukraine observed a pattern of mineral contents in safflower flores. The pattern was K>Ca>Si>Mg>P>Na>Fe >Al>Zn>Sr>Mn [31]. The results of Barashovets and Popova [31] showed that safflower flores contained Na, K, Ca, Fe, Fe, and Zn as follows 54, 2040, 680, 24, and 6.8 mg/100g, respectively. The results of the current study concur with those of Nagaraj *et al*. [47], and Barashovets and Popova [31]. In conclusion safflower flores are an excellent source of K and Mg that have a role in lowering hypertension in human beings by confounding the negative effects of Na and Ca in relation to blood pressure [48-52].

Furthermore, the results of the mineral content of safflower flores differed with time of picking. Harvesting safflower flores at the end of flowering resulted in Ca and Fe contents being high. On the contrary, Mg, K, and Na contents were high when flores were picked at full bloom. Flores picked at the onset of flowering were high in Zn. Similar results were reported by Li *et al*. [53] found that mineral elements content of peony flores (*Paeonia lactiflora*) were significantly affected by genetic (cultivar) and time of flores harvest. Peony flores picked at the flower bud stage had the high Zn but low in Na, Mg, and Fe contents [53]. While flores picked at full blossom were high in Mg [53]. When peony flores were picked at the senescing stage they were high in Ca, Fe, and Ni [53]. Li *et al*. [53] further reported that K content of peony flores was not influenced by time of pickingt [53]. Accumulation of macro and micronutrients in *Atractylodes japonica* Koidz as affected by picking time has been reported [54]. The mineral elements Ca and Mg were high in late picked flores, while Fe, Cu, Al, and AC contents were high in early picked flores [54]. The content of mineral elements in plant tissues and organs are affected by many factors such as soil type and fertility, interactions of roots and soil, absorption system, and translocation patterns in the plants [55-56]. The movement of mineral elements in the plant is influenced by plant species, organs, phenological stages, and environmental variables during growth [56-61]. Mineral elements are the building blocks of organs and tissues in plants, and therefore, they play vital roles in many biochemical and physiological processes [41, 59, 62, 63] and maintenance of osmotic pressure and pH [57, 59, 64]. Magnesium is a vital part of the chlorophyll molecule, and it affects light interception and capture in plants [57, 59, 64-66]. Minerals elements such as Zn, Cu, Mg, and Fe are important in the biosynthesis of secondary metabolites [57, 64]. Results of the current study have shown that safflower flores can be a source of K, Ca, Mg, Fe, and Zn for human beings. For example, K and Ca are essential for lowering the likelihood of coronary artery disease [19, 67] and building strong, dense bones [68], respectively.

4.2 Genotype and time of picking safflower flores on proximate dependent variables

The genotypic variation observed in CP, CF, MC, FC and AC of safflower flores was explained by differences in gene transcription and translation of these traits as influenced by the environment. In the same manner, time of safflower flores picking influenced flores CP, CF, MC, FC and AC and this was attributed to functions of the flower in angiosperms. The role of flowers in angiosperms is reproduction, and once the pollination process is finished the flores senesce and die [59, 64, 69, 70]. During flower senescence nutrients are remobilized to growing tissues and organs before death [64, 69, 71-74]. The remobilization of nutrients during senescence was partly attributed to variation in safflower flores mineral and proximate variables contents with time of picking safflower flores. Senescence of flowers is controlled by genes that permits plants to strategically separate large cellular molecules and organelles before cell death and repartition nutrients into its flores [64, 69]. Endogenous phytohormones biosynthesized by plants also in the regulation of flores senescence [64, 71].

5. Conclusions

Genotype and time of picking safflowers flores influenced flores mineral and proximate dependent variables indicating genotype and environment interaction. The authors concluded that ground safflower flores can be added to foods during cooking, smoothies or taken as herbal tea as food supplement for the supply of Ca, Mg, K, Na and Zn apart from other beneficial health benefits. The genotype that had high flores mineral and proximate variables was Turkey. It was not conclusive when to pick safflower flores to optimize both mineral and proximate variables ccontents.

6. Acknowledgement

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7. Conflict of Interest

The authors declare that no competing conflict of interest exists concerning this publication.

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