http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 3 (4): 568-570, 2000

The Caper (*Capparis ovata* Desf.var. *palaestina* Zoh.) Culture in Turkey

Özlem Tonçer* and Sezen TANSI**
*University of Dicle, Faculty of Agriculture, Field Crops Department-21280 Diyarbakir, Turkey
**University of Çukurova, Faculty of Agriculture, Field Crops Department-01330 Adana, Turkey

Abstract: *Capparis ovata* Desf. is one of the oldest known medicinal plants. It grown as wild in the arid, stony and poor soils of Diyarbakir region in Turkey. The experiments were conducted in open field conditions at University of Dicle, Faculty of Agriculture experiment area. The effect of applications GA_3, H_2SO_4 and different sandpaper on germination percentage of seed were studied and, the significant differences were found in terms of germination percentage of seed influenced by application. The maximum germination percentage (55%) was obtained in the seeds scarified by P320A sandpaper thickness with GA_3 solutions of 400 ppm for 2 hour.

Key words: caper, culture, turkey

Introduction

Caper (*Capparis ovata* Desf. var. *palaestina Zoh*.), a member of the family *Capparacea* is an important commercial and medicinal crop. In Turkey, it was exported 4.000 tons, accounting to $ 12.000 (Anonymous, 1996a). Flower buds, fresh leaves, roots and fruits of caper are used in culinary uses such as pasta sauces, pizza, fish, meats and salads. Young shoots bearing immature small leaves may also be eaten as vegetable. Therapeutic effects of caper are anti-rheumatic, diuretic, tonic, anti-flatulence, hepatic stimulant, arteriosclerosis, vermifuges, kidney disinfectants, improving liver function. Derivates of the Bark are used in pharmaceutical preparations (Kontaxis, 1989). Flower buds of caper is processed into sauces, and exported to Europe, accounted $ 2.5 million in 1996. Caper sauces is only produced in Turkey and Morocco. Thus, Turkey has determinative role in this market with the 50% share (Anonymous, 1996b).

The Southeast Anatolia Project (GAP) which is one of the greatest project of the world consists of Adiyaman, Diyarbakir, Gaziantep, Mardin, Siirt, Sanlurfa, Batman and Sirnak provinces in Turkey. Most experts identified soil erosion in the GAP region as the most urgent environmental problem. A major part of GAP area is subject to erosion, 72.3% to serious erosion and 38.6% to very serious erosion (Celik, 1994). The solutions is related to Flora. Vegetation is a consequence of soil fertility, at the point where vegetative cover is adequate.

Caper seed is difficult to germinate (Kontaxis, 1989). Fresh caper seeds germinate readily but only in low percentage. Dried seeds become dormant and are notably difficult to germinate and therefore require extra measures to grow (Alkire, 1998).

Considering potentially of caper for rural developing as a erosion control agent, new crop and new income sources, this study was aimed to cultivate caper growing under difficult environmental conditions in Southeast Anataolia Region.

Materials and Methods

Mature fruits of *Capparis ovata* were collected from wild plants in August and September from a population of Diyarbakir conditions in Turkey. The plants were identified as *Capparis ovata* Desf. var. *palaestina* Zoh. at Faculty of Science. Caper was grown under the Diyarbakir conditions prevailing terrestrial type climate which has hot and drought summer and hard winters. Seeds were sepapercentaged from fruit material, rinsed in top water, dried in shade and kept at room. The seed viability was determined by Tetrazolium test using a 400-seed as four replication of 100 seeds. The parts of the seed that are viable were become red, the non-viable parts remained white.

Seed treatments were as follows:

- Seed were dipped in GA_3 solutions 0 to 200, 300 and 400 ppm for periods of 0 to 1, 2, 3 and 24 h
- Seeds were scarified by P120A, P220A, P240A, P320A, P360A and P600A sandpaper (sand grain/cm^2) then dipped in GA_3 solutions of 0 to 200, 300 and 400 ppm for periods of 0 to 1, 2, 3 and 24 h
- Seed were dipped in the concentrated H_2SO_4 for 0, 20, 30 and 40 min then rinsed in top water and dipped in GA_3 solutions of 0 to 200, 300 and 400 ppm for periods of 0 to 1, 2, 3 and 24 h

Seeds were sown at a depth of a few centimeters in open field seed bed in the month of March. The soil mix of 2:1:1 parts soil, sand and organic matter, respectively.

Germination was recorded at a week intervals within the experimental period. Pre-treatments effects were assessed by split split plot design. LSD test was carried out to test significances of all differences.

Results and Discussion

Tetrazolium test showed that the percentage of viable seed was more than 87%. The germination percentage of caper seeds showed differences according to concentrations of GA_3 and application of different sandy paper (Table 1). The highest germination percentage was obtained in the seeds scarified by P320A sandpaper thickness with GA_3 solutions of 400 ppm for 2 hour in first year. Also, in the second year, the highest germination rations were obtained from the control, P120A and P240A sandpaper treatments, followed by 400 ppm GA_3 applications (Table 1).

The germination percentage of caper seeds showed differences according to concentrations of GA_3 and dipping durations (Table 2). In the first year the highest germination percentage 35% was determined in the seeds dipped 400 ppm GA_3 for 24 hour. The highest germination percentage was obtained from 400 ppm GA_3 application for long duration such as 24 h is probably caused by thick seed testa (Table 2).

The germination percentage of caper seeds showed differences according to concentrations and dipping durations of GA_3 and dipping durations of H_2SO_4 (Table 3). In this first year, the highest percentage was determined in the seeds dipped 400 ppm GA_3 non-applied H_2SO_4. In second year, the highest germination

Table 1: Germination percentage of caper seeds as influenced by sandpaper application soaking duration and GA_3 concentration

GA_3 Dipping Duration (h)	Sandpaper Thickness	GA_3 Concentrations (ppm)							
		0		200		300		400	
		1.Year	2.Year	1.Year	2.Year	1.Year	2.Year	1.Year	2.Year
0	Control	5.0d	13.0b	5.0d	13.0b	5.0d	13.0b	5.0d	13.0b
	P120A	20.0a	8.0c	20.0a	8.0c	20.0a	8.0c	20.0a	8.0e
	P220A	20.0a	17.0a	20.0a	17.0a	20.0a	17.0a	20.0a	17.0a
	P240A	5.0d	10.0bc	5.0d	10.0bc	5.0d	10.0bc	5.0d	10.0bc
	P320A	15.0b	8.0c	15.0b	8.0e	15.0b	8.0e	15.0b	8.0e
	P360A	10.0c	20.0a	10.0c	20.0a	10.0c	20.0a	10.0e	20.0a
	P600A	0.0e	0.0d	0.0e	0.0d	0.0e	0.0d	0.0e	0.0d
1	Control	5.0d	13.0b	0.0e	21.0d	15.0c	13.0d	0.0d	27.0c
	P120A	20.0a	8.0c	0.0e	29.0b	10.0b	8.0e	10.0c	29.0b
	P220A	20.0a	17.0a	50.0a	29.0b	20.0b	42.0a	10.0c	25.0c
	P240A	5.0d	10.0bc	15.0c	29.0b	20.0b	29.0b	0.0d	17.0d
	P320A	15.0b	8.0c	10.0d	25.0c	40.0a	13.0d	20.0b	33.0a
	P360A	10.0c	20.0a	0.0e	38.0a	0.0e	29.0b	30.0a	29.0b
	P600A	0.0e	0.0d	0.0d	29.0b	15.0c	21.0c	10.0c	13.0e
2	Control	5.0d	13.0b	0.0d	13.0e	0.0c	29.0a	10.0c	17.0e
	P120A	20.0a	8.0c	5.0c	21.0c	5.0b	8.0d	0.0d	17.0e
	P220A	20.0a	17.0a	20.0a	25.0b	0.0c	21.0c	0.0d	25.0c
	P240A	5.0d	10.0bc	10.0b	21.0c	0.0d	25.0b	10.0c	33.0b
	P320A	15.0b	8.0c	20.0a	17.0d	0.0c	21.0c	0.0d	21.0d
	P360A	10.0c	20.0a	0.0d	17.0d	0.0c	25.0b	55.0a	17.0e
	P600A	0.0e	0.0d	5.0c	21.0c	0.0c	21.0c	35.0b	38.0a
3	Control	5.0d	13.0b	5.0d	17.0b	0.0d	13.0c	0.0g	25.0a
	P120A	20.0a	8.0c	15.0c	8.0d	45.0a	8.0d	50.0a	8.0c
	P220A	20.0a	17.0a	15.0c	17.0b	0.0d	17.0b	35.0b	21.0b
	P240A	5.0d	10.0bc	20.0b	21.0a	5.0c	17.0b	5.0f	4.0d
	P320A	15.0a	8.0c	0.0e	17.0b	0.0d	8.0d	15.0d	25.0a
	P360A	10.0c	20.0a	30.0a	8.0d	0.0d	0.0e	20.0c	21.0b
	P600A	0.0e	0.0d	0.0e	13.0e	10.0b	21.0a	10.0e	25.0a
24	Control	5.0d	13.0b	0.0d	46.0a	0.0c	42.0a	35.0a	33.0d
	P120A	20.0a	17.0a	10.0b	46.0a	0.0c	33.0b	0.0d	46.0a
	P220A	20.0a	8.0c	0.0d	42.0b	0.0c	42.0a	20.0b	38.0e
	P240A	5.0d	8.0c	5.0c	42.0b	15.0a	42.0a	20.0b	46.0a
	P320A	15.0b	0.0d	5.0c	33.0c	0.0e	42.0a	15.0c	42.0b
	P360A	10.0c	10.0bc	20.0a	42.0b	5.0b	42.0a	15.0c	42.0b
	P600A	0.0e	20.0a	0.0d	42.0b	0.0c	33.0b	20.0b	42.0b

L.S.D. (Int.) (% 5): 1. Year: 3.5, 2, Year: 3.2

Table 2: Germination percentage of caper seeds as influenced by Ga_3 concentration and soaking duration

GA_3(ppm)	GA_3 Dipping Durations (h)					
	0	1	2	3	24	Average
1997						
0	5.0a	5.0b	5.0b	5.0a	5.0b	5.0
200	5.0a	0.0c	0.0e	5.0a	0.0e	2.0
300	5.0a	15.0a	0.0e	0.0b	0.0c	4.0
400	5.0a	0.0c	10.0a	0.0b	35.0a	10.0
Average	5.0	5.0	4.0	3.0	10.0	5.0
1998						
0	13.0a	13.0c	13.0c	13.0c	13.0d	13.0
200	13.0a	21.0b	13.0c	17.0b	46.0a	22.0
300	13.0a	13.0e	29.0a	13.0c	42.0b	22.0
400	13.0a	27.0a	17.0b	25.0a	33.0c	23.0
Average	13.0	19.0	18.0	17.0	34.0	20.0

L.S.D. (Int.) (% 5): 1. Year: 2.6, 2, Year: 2.4

percentage was determine in the seeds dipped 200 ppm GA_3 for 24 hour after treatment with H_2SO_4 for 40 min and dipped 400 ppm GA_3 for 24 h after treatment with H_2SO_4 for 20 min (Table 3). In other study, GA_3 and KNO_3 applications significantly increased the germination percentage (Toncer, 1999). In contrast to literature reviews, leaving seeds into H_2SO_4 for 40 min. has no negative effect on germination (Orphanos, 1983). This can be attributed seed testa of *C. ovata* is more thicker then other

Table 3: Germination percentage of caper seeds as influenced by soaking duration of H_2SO_4 concentrations and soaking duration of GA_3

GA_3 (ppm)	H_2SO_4 (min)	GA_3 Dipping Durations (h)									
		0		1		2		3		24	
		1.Year	2.Year	1.Year	2.Year	1.Year	2.Year	1.Year	2.Year	1.Year	2.Year
0	0	5.0b	13.0c	5.0b	13.0c	5.0b	13.0c	5.0b	13.0c	5.0b	13.0c
	20	15.0a	25.0a	15.0a	25.0a	15.0a	25.0a	15.0a	25.0a	15.0a	25.0a
	30	5.0b	21.0b	5.0b	21.0b	5.0b	21.0b	5.0b	21.0b	5.0b	21.0b
	40	5.0b	21.0b	5.0b	21.0b	5.0b	21.0b	5.0b	21.0b	5.0b	21.0b
200	0	5.0b	13.0c	0.0c	21.0a	0.0a	13.0c	5.0b	17.0a	0.0b	46.0b
	20	15.0a	25.0a	10.0b	17.0b	0.0a	25.0a	0.0b	4.0c	5.0a	38.0d
	30	5.0b	21.0b	0.0c	17.0b	0.0a	13.0a	5.0a	13.0b	0.0b	42.0c
	40	5.0b	21.0b	25.0a	21.0a	0.0a	17.0b	0.0b	17.0a	0.0b	50.0a
300	0	5.0b	13.0c	15.0a	13.0c	0.0b	29.0a	0.0c	13.0c	0.0b	42.0b
	20	15.0a	25.0a	5.0c	25.0a	0.0b	25.0b	15.0a	25.0a	0.0b	42.0b
	30	5.0b	21.0b	10.0b	8.0d	20.0b	25.0b	5.0b	17.0b	0.0b	46.0a
	40	5.0b	21.0b	0.0d	21.0b	0.0b	21.0c	5.0b	13.0c	5.0a	33.0c
400	0	5.0b	13.0c	0.0c	17.0b	10.0b	17.0d	0.0b	25.0a	35.0a	33.0d
	20	15.0a	25.0a	0.0c	29.0a	20.0a	21.0c	0.0b	8.0d	15.0a	50.0a
	30	5.0b	21.0b	20.0a	13.0c	0.0c	29.0a	5.0a	21.0b	5.0c	46.0b
	40	5.0b	21.0b	5.0b	17.0b	0.0c	25.0b	0.0b	13.0c	15.0b	42.0c

(Toker *et al.*, 1994). In both experiment year, when hard seed coat removes by scarifying, the caper seeds would performe subsequent germination. Orphanos (1983) reported that the seed coat is distributed trought microbial action during the winter so that the seed may germinate in spring. It is understood that dormancy of caper seed is imposed by its covering (Sozzi and Chiesa, 1995). Germination of seeds is influenced not only by temperature, but also by light, breaking of the seed coat. The presence of a hard seed coat that prevents absorption of oxygen or water. In nature, when enough rain falls to leach inhibitors from the seed (Bewley and Black, 1985). Also, the structure of caper seed and mucilage layer can prevent to germination. Therefore, available water in seed bed greatly enhanced germination percentage in our trials. In contrast to this study, other research was obtained low result in open conditions (Barbera *et al.*, 1991).

There is evidence that soaking in GA_3 for 24 h generally produce possitive results for germination percentage in all treatments. Caper seed could only germinate if GA_3 was treated (Table 1). Also, GA_3 treatments after mechanical or chemical scarification gave quite well results. Thus, it is likely that GA_3 action speeds germination percentage by increasing O_2 gases uptake (Bewley and Black, 1985).

In general, all treatments used in this study have possitive effects on the germination percentage of caper seeds. Caper seedling after emergence grows very slowy, in this period, very rare and weak rooting systems needs regular irrigations, and it is necessary to keep soil at field capacity, if the irrigation is below the requirement soil surface dries rapidly, causing the wilting, over irrigation leads to decaying at seedlings, in both case young plants easily die. Also, keeping the soil moisture constant under field conditions enhanced and stimulated the germination. Consequently, caper will important role in the improving the export income of Turkey, also it will provide additional income of people living in the Southeast Anatolia. It is expected that erosion can be reduced by its cultivation, and it will bring the marjinal lands under relatively cropping.

References

Alkire, B., 1998. Capers, new crop factsheet. Center for New Crops and Plant Products, Purdeu University, West Lafayette, IN 47907-1165, USA., pp: 1-8.

Anonymous, 1996a. Dis ticaret mustesarligi Ihracaat. Genel Modurlugu Raporlai.

Anonymous, 1996b. Erozyona karsi koklu cozum kapari. Orman bakanligi agaclandirma ve erozyon kontrolu genel mudurlugu A.G.M. Yaymlari, Cesitli Yaymlar Ankara Serisi, No. 2, pp: 47.

Barbera, G., R.D.I. Lorenzo and E. Barone, 1991. Observations on *Capparis* populations cultivated in Sicily and on their vegetative and productive behavior. Agric. Med., 121: 32-39.

Bewley, J.D. and M. Black, 1985. Seeds: Physiology of Developent and Germination. Plenum Press, New York, Pages: 445.

Celik, I., 1994. Gap bolgesinde erozyon, erozyonu onleme cahsmalarinda karsilasilan guclukler, cozum onerileri, GAP Bolgesinde Bitki Ortusu ve Ormanlar. Cevre Vakfi Yaymlari, Turkiye, pp: 76-91.

Kontaxis, D.C., 1989. Capers, A New Crop for California. Small Farm Center University of California, Davis, CA., pp: 1-3.

Orphanos, P.I., 1983. Germination of caper (*Capparis spinosa* L.) seeds. J. Hortic. Sci., 58: 267-270.

Sozzi, G.O. and A. Chiesa, 1995. Improvement of caper (*Capparis spinosa* L.) seed germination by breaking seed coat-induced dormancy. Scient. Hortic., 62: 255-261.

Toker, M.C., G. Taker and R. Yilmazer, 1994. *Capparis spinosa* L. ve *Capparis ovate* Desf. Uzerinde Anatomik ve Morfolojik Cahsmalar, XII. Ulusal Biyoloji Kongresi, 6-8 Temmuz, 1994, Edirne, Pages: 202.

Toncer, O., 1999. The investigation on possibilities of propagation of caper (*Capparis ovate* Desf. var. *palaestina* Zoh.) in Southeast Anatolia region. Master's Thesis, Department of Field Crops, Faculty of Agriculture, Cukurova University, Adana, Turkey.