

OBSERVATIONS ON THE GERMINATION OF TEA SEED VARIETY QI-MEN AS INFLUENCED BY SOAKING, SHELL REMOVAL AND SHELL CRACKING

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(Received May 23, 1989; revised May 21, 1990)

The effect of pre-soaking, cracking and shell removal on the germination of tea seed variety Qi-men (China) was investigated during 1986 and 1987. Soaking the seed for one day resulted in a higher percentage of germination in all the above mentioned treatments. But decreased with increase in the duration of soaking. Soaking for 7 days had an adverse effect on germination in all treatments. In comparatively old seed (1986) shell removal or cracking had little or no effect on germination. However, with comparatively fresh seed (1987) soaking for one, two and three days increased the germination percentage. Although, cracking had little or no effect on the germination of old seed it greatly speeded up the germination of the fresh seed. Even with the fresh seed soaking the seeds upto seven days adversely affected the germination. It could be concluded that soaking of the seed upto three days improves the germination of both fresh and old seed. But periods longer than three days adversely affect the germination. Shell removal or cracking had a positive effect on germination only with the comparatively fresh seeds. But, had little or no effect on the germination percentage of the comparatively old seeds.

Key words: Germination, Tea seed, Shell cracking, Shell removal.

Introduction

Tea is a new introduction in the country, its propagation and production techniques are yet to be developed. Tea can be propagated both vegetatively and by seed. In tea, seeds showing protruding radicles are taken as having been germinated [1-3]. The conditions essential for germination are viable seed, sufficient supply of water, favourable temperature, availability of oxygen and suitable light for some species [4,5]. Tea seeds do not have a dormancy period and germinate as soon as they are planted in a favourable environment. Moreover, tea seeds lose their viability very rapidly after harvest [3].

It has been found with many seed species, that removal of the seed coat or damaging it, accelerates the germination of embryo. [1,6-8]. This may be due to the reduction of the imperviousness of the seed coat to water, air and mechanical resistance. Pre-soaking of tea seeds in water (3 to 5 days) and subsequent cracking or removal of their shell markedly accelerated the germination of comparatively fresh tea seeds. Older seeds too showed a similar response to pre-soaking, but the cracking of the seed shell did not have any significant effect on the germination [1]. Sebastiampillai and Anandappa [9] reported that pre-soaking the seeds in water upto four days prior to sowing in sand improved the germination of the seed. The earlier germination of pre-soaked seed is probably due to the rapid absorption of water by the seed with the soaking and the concomitant elevation of seed moisture when compared to the seed in the sand medium. They also observed that cracking the seed coat hastened the germination and was equivalent to soaking the seeds in water for 4 days [10]. Obtained the highest germination of 97% by soaking the intact tea seeds (shell intact) in either 10, 50 or 100 g/l

ethephon for 24 hr. Bonheure [11] obtained 75% germination of the seed after 7,33 and 55 days, in seed where seed coat was removed, split and left intact respectively, on seed pre-soaked for 7 days with seed intact prior to the imposition of the said treatments in all cases. Abu-shakra and Aqil [12] recorded maximum germination when the sugar-beet seed of the variety Mezzano AU/N was washed in running tap water for 24 hr or soaked in water at 30° and 40° for 12 hr. To supplement the knowledge in this area, this study was carried out to investigate the role of the shell in germination with regard to the effect of pre-soaking of the seed and cracking of the shell.

Materials and Methods

The study was conducted at Tea Cultivation Research Station, Rawalpindi, in 1986 and 1987 to investigate the effect of soaking of seed, cracking and shell removal on germination of tea seed variety Qi-men received from China. The seeds where the shell was removed, cracked and left intact were "soaked" in water 1,2,3,5 and 7 days respectively and subsequently germinated with the shell removed (embryo), cracked or intact. Accordingly, the tests were carried out with following six groups of seeds.

- (a) Shell removed while soaked; germination with shell removed.
- (b) Shell cracked while soaked; germination with shell removed.
- (c) Shell intact while soaked; germination with shell removed.
- (d) Shell cracked while soaked; germination with shell cracked.
- (e) Shell intact while soaked; germination with shell removed.
- (f) Shell intact while soaked; germination with shell intact.

The seeds were placed for germination on May 1, 1986 and March 22, 1987 during the year, 1986 and 1987 respectively in earthenware pots filled with river sand at prevailing temperature in open atmosphere. The tea seeds were cracked with the help of a wooden hammer. Fifty seeds were placed in each earthenware pot. All the treatments were replicated thrice. The progress of germination was checked at daily intervals. Seeds showing protruding radicles were taken as having germinated.

All the data recorded regarding germination of tea seed were analysed by Fisher's Method [13] of Analysis of variance. L.S.D. test was used to find out significance of differences of treatment means.

Results and Discussion

The results in Table 1 reveal that the soaking of seed for one day appreciably increased the germination in all treatments. Soaking for 2,3 and 5 days reduced the germination percentage but not significantly. However, soaking of seeds for 7 days had a significant adverse effect on the

germination particularly on those where the shell was cracked (d) and shell removed (a, b and c) during the process of germination. Visser and Tillekeratne [1] reported that soaking of old seeds (3 months) for 6 days increased the germination appreciably. They also reported that soaking of old seeds for more than 6 days had an adverse effect on germination particularly of shell removed/cracked seeds. Eventual germination of shell removed seeds (a,b,c) and cracked seeds (d) was less than that of intact seeds (e,f). This is probably due to the fact that a greater number of the former seeds rotted as the embryos had no protection and cracked shell afforded less protection against rotting organisms. This was also reported by Visser and Tillekeratne [1].

It appears from the results (1987), presented in Table 2 that soaking treatments had significant effect on the germination of tea seeds. Whereas shell cracking or removal had no significant effect on the germination of the tea seed. Interaction was however, found significant. The highest germination percentage in treatments (a,b and c) was recorded when seed was soaked for one day. In treatments (d), soaking

TABLE 1. GERMINATION PERCENTAGE OF TEA SEED VARIETY QI-MEN (CHINA) SOAKED IN WATER FOR DIFFERENT TIMES AND SUBSEQUENTLY GERMINATED WITH SHELL INTACT, CRACKED OR REMOVED DURING THE YEAR, 1986.

Treatments		Tea seed soaked in water for						Average for treatments
Soaked with shell	germination with shell	0 day	1 day	2 days	3 days	5days	7 days	
a. Removed	Removed	7.33	9.30	6.00	4.00	0.00	0.67	4.56
b. Cracked	Removed	5.33	36.00	30.00	28.67	11.30	2.67	19.00
c. Intact	Removed	6.67	28.00	34.67	27.30	28.67	11.30	22.77
d. Cracked	Cracked	12.00	34.67	23.30	24.67	22.00	2.00	19.77
e. Intact	Cracked	8.67	40.67	33.33	34.67	36.00	14.00	27.88
f. Intact	Intact	5.67	42.67	24.00	36.67	42.00	18.67	28.11
Average for soaking		7.44	31.88	25.22	26.00	23.33	8.22	-
L.S.D. 5% for soaking:		9.93						
L.S.D. 5% for treatment:		9.93						

TABLE 2. GERMINATION PERCENTAGE OF TEA SEED VARIETY QI-MEN (CHINA) SOAKED IN WATER FOR DIFFERENT TIMES AND SUBSEQUENTLY GERMINATED WITH SHELL INTACT, CRACKED OR REMOVED DURING THE YEAR, 1987.

Treatments		Tea seed soaked in water for						Average of treatments
Soaked with shell	germination with shell	0 day	1 day	2 days	3 days	5days	7 days	
a. Removed	Removed	40.67	85.33	77.33	50.00	39.33	34.00	54.44 N.S
b. Cracked	Removed	64.00	72.00	64.67	63.33	58.67	45.33	61.33
c. Intact	Removed	73.35	73.35	72.00	50.00	50.67	42.00	60.23
d. Cracked	Cracked	60.67	61.33	65.33	64.67	58.00	54.67	60.78
e. Intact	Cracked	42.00	59.33	50.00	72.67	71.33	52.67	58.00
f. Intact	Intact	51.33	60.67	60.67	74.67	70.67	50.00	61.34
Average for soaking		55.40	68.66	65.00	62.55	58.11	46.44	
L.S.D. 5% for soaking:		9.50						
L.S.D. 5% for soaking x treatments:		23.27						

N.S. = Non significant.

for two days proved beneficial. Whereas in treatments (e and f), 3 days, soaking resulted in maximum germination. However, soaking for 7 days appeared to have an adverse effect on germination, especially in naked embryos (a,b,c). The removal of the seed shell prior to soaking reduced the germination percentage when compared with the seed intact (compare a with c). It can be noted that the germination of the naked embryos (a,b,c) (Table 1 and 2) is little affected by pre-soaking. This is probably due to the fact that once the seed coat is removed, the rate of water uptake, respiration and mechanical resistance no longer become limiting.

These observations are confirmed by the experiment of Visser and Tillekeratne [1] who found that the removal of the seed shell is accompanied by an increased water uptake and physiological activity of the embryo. Likewise favourable effect of cracking the shell before-hand can be attributed to a decrease mechanical resistance and increased respiration. Similar reasons for increased and rapid germination by soaking and shell cracking or its entire removal have been reported by [9-11]. Similarly Abu-Shakra and Aqil [12] recorded maximum germination in sugar-beet when the seed was washed in running tap water for 24 hrs. or soaked in water at 30° and 40° for 12 hrs.

From the results presented in Table 1 and Table 2, it could be concluded that the very low germination percentage recorded during 1986 compared to that during 1987, was due to the comparatively old seed used for the experiments, during 1986. Visser and Tillekeratne [1] also obtained lower germination with old tea seeds. They also reported that cracking had little or no effect on the germination of old seed but greatly speeded-up the germination of fresh seed and attributed to the difference.

Pre-soaking and cracking of the seeds would trigger the conditions required for the initiation of germination, such as the provision of the embryo with enough moisture and reducing of mechanical hindrances. The importance of the fresh seed is such that the embryo responded quickly when provided with the right conditions for germination as oppose to the older seeds which have lost most of their vigour.

In view of the above, the old seeds failed to accrue the extra benefits derived on the water and oxygen uptake asso-

ciated with shell cracking and/or removal. At this juncture, it should be emphasised that test with embryos (shell removed) enabled a quick assessment of the germination capacity of the seed, provided the seeds were comparatively fresh. A prolonged storage was found to decrease the germination percentage of embryos owing to them rotting in the germination medium.

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