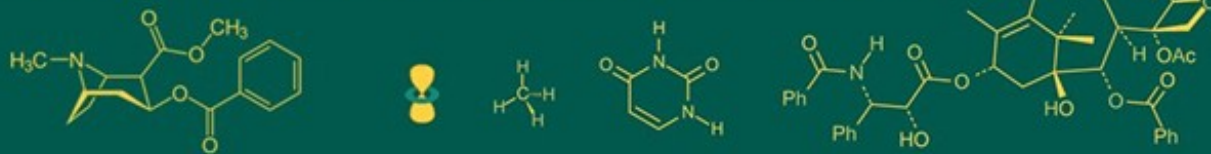


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Management of groundnut bruchid, *Caryedon serratus*, with seed protectants and their effect on stored groundnut seed

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ABSTRACT

The present study entitled “Management of groundnut bruchid, *Caryedon serratus*, with seed protectants and their effect on stored groundnut seed” was conducted at the Seed Entomology Laboratory, Seed Technology Research Unit, Seed cell, Mahatma Phule Krishi Vidyapeeth, Rahuri, during 2025–26. A laboratory experiment was conducted in a Completely Randomized Design with different chemical and botanical seed treatments to evaluate their efficacy against *C. serratus* and their effect on seed storability during storage. Observations on egg laying, adult emergence, seed damage, seed weight loss, seed germination and moisture content were recorded. Deltamethrin 2.8% EC @ 0.4 ml/kg seed recorded the lowest egg laying (1.33 eggs/100 pods), followed by spinosad 45% SC @ 0.3 ml/kg seed (1.41 eggs/100 pods). Spinosad and deltamethrin completely prevented adult emergence, seed damage and seed weight loss. Among the botanical treatments, neem seed oil @ 10 ml/kg seed was the most effective, recording 2.33 eggs, 1.66 adults, 1.58 per cent seed damage and 0.21 per cent seed weight loss. Deltamethrin recorded the highest seed germination (92.41%), followed by spinosad 45 % SC @ 0.3 ml/kg with 91.67 per cent and neem seed oil @ 10 ml/kg with 90.33 per cent. The lowest moisture content recorded in deltamethrin 2.8 % EC @ 0.4 ml/kg (8.84%) while spinosad 45 % SC (8.88%), neem seed oil (8.93%) and the highest in the untreated control. Thus, deltamethrin 2.8% EC @ 0.4 ml/kg and spinosad 45% SC @ 0.3 ml/kg were found to be the most effective chemical treatments, while neem seed oil @ 10 ml/kg emerged as the most promising botanical treatment for managing *C. serratus* and maintaining the storability and physiological quality of groundnut seed.

Keywords: *Caryedon serratus*, Groundnut pods, Botanicals, Deltamethrin, Spinosad, Neem seed oil, Castor seed oil

Introduction

Groundnut (*Arachis hypogaea* L.), commonly known as peanut, is an important oilseed and food legume crop cultivated extensively in tropical and subtropical regions. Its kernels contain approximately 50 per cent oil and 35 per cent protein, along with essential minerals and vitamins, making groundnut valuable for human nutrition, livestock feed and industrial applications (Dwivedi *et al.*, 2003) [1]. However, insect pests during production and storage adversely affect seed quality, viability and economic returns. More than 100 insect species have been reported to infest stored groundnut, although only a limited number are considered economically important (Redlinger *et al.*, 1982) [2].

Among the major storage pests, the groundnut bruchid, *Caryedon serratus* (Olivier), is particularly important because of its ability to infest intact groundnut pods. Its larvae penetrate the pod wall and develop within the kernels, causing quantitative and qualitative losses, including reductions in seed weight, germination potential, nutritional quality and market value (Davey, 1958; Wightman *et al.*, 1987) [3, 4]. The pest is also associated with several leguminous host plants, including tamarind (*Tamarindus indica*) and other tree legumes like Indian beech (*Pongamia pinnata*) (Shivalingaswamy, 1987; Singal *et al.*, 1989) [5, 6].

Caryedon serratus undergoes complete metamorphosis, comprising egg, larval, pupal and adult stages. Females lay eggs on the surface of pods or seeds, and newly hatched larvae penetrate the pod wall to feed internally on the kernel. The larval stage is responsible for the major portion of seed damage, whereas adult emergence produces characteristic circular exit holes that indicate infestation (Ranga Rao *et al.*, 2010) [7]. The duration of development varies with temperature, humidity and host substrate. Available studies have reported four larval stages, rather than consistently establishing five to six instars under all conditions. Therefore, developmental duration and the number of larval instars should be reported only with appropriate supporting evidence (Davey, 1958) [3].

Several researchers, including Nadaf *et al.* (2010) [8], Ummer (2012) [9], Bhogeesh *et al.* (2014) [10], Faraz *et al.* (2015) [11], Rana *et al.* (2018) [12] and Sakhare *et al.* (2018) [13], have investigated different management aspects of *C. serratus*. The use of suitable protectants and storage treatments remains important for reducing insect infestation and preserving seed quality. Accordingly, the present study was undertaken to evaluate the efficacy of selected oils used as pod and fabric treatments against *C. serratus* and to assess their effects on the viability and quality of stored groundnut seed.

Materials and Methods

Laboratory experiment entitled “Management of groundnut bruchid, *Caryedon serratus*, with seed protectants and their effect on stored groundnut seed” was undertaken during 2025-26 in Seed Entomology laboratory of Seed Technology Research Unit, Mahatma Phule Krishi Vidyapeeth, Rahuri to evaluate the efficacy of various seed protectants against this pest and their influence on the quality of stored groundnut seeds. Freshly harvested and dried 50 kg groundnut pods of variety *Phule morna* were used for the experiment. Different oils (Sunflower oil, Neem seed oil, Castor seed oil, Musturd seed oil, Soyabean oil) @ 10 ml / kg of seed and insecticides (Spinosad 45 % SC @ 0.3 ml/kg and deltamethrin 2.8 % EC @ 0.4 ml/kg) were used as pod treatments against *Caryedon serratus*. For each treatment, 2 kg of pods were used. In the treatment, pods were treated with oil and insecticides, shade dried and packed in 2 kg capacity gunny bags After imposing treatments, all the bags were closed and kept on the shelf in

the laboratory under room temperature for further observations. The experiment was initiated in August 2025 with eight treatments by adopting Completely Randomized Design (CRD) with three replications.

The observations viz. number of eggs laid, number of adults emerged, per cent pod damage, per cent seed weight loss were, per cent seed germination and seed moisture content were recorded at three months interval up to 12 months of storage.

1. Effect of oil seed treatments on bruchid (*Caryedon serratus*) infestation in groundnut during storage (at three months interval upto 12 months):

a. Number of eggs laid (Fecundity)

Number of eggs, from a representative sample, 100 pods from oil treated pods as per treatment were taken. Hundred (100) pods from each replication were drawn and used to count the average number of eggs laid on each seed by using magnifying lens.

b. Number of adults emerged

Number of (fresh emerged) adults in each jar were calculated to see the inhibition of *Caryedon serratus* emergence by different treatments.

c. Seed damage (%)

Seed damage was assessed by randomly selecting 100 pods from each treatment in each replication. The selected pods were carefully examined under a 10X magnifying lens to identify damage caused by the groundnut bruchid, *Caryedon serratus*. The numbers of healthy and infested pods were recorded and the percentage of seed damage was calculated using the method described by Tamiru *et al.* (2016).

$$\text{Seed Damage (\%)} = \frac{\text{Number of seeds with holes}}{\text{Total number of seeds}} \times 100$$

d. Seed weight loss (%)

Separate set of experiment was installed for determination of seed weight loss. 100 g treated seed from each treatment was taken in separate jar and observed monthly to determine seed weight loss. Seed weight loss was computed by the following formula as suggested by Harris and Lindblad (1978).

Seed weight loss (%) = (Original weight – Final weight) / Original weight X 100

$$\text{Germination (\%)} = \frac{\text{Number of normal seedlings emerged}}{\text{Total number of seeds for test}} \times 100$$

f. Seed moisture content (%)

Moisture content was determined by hot air oven method (ISTA, 2020). 10 g of seeds were taken from each treatment and replication.

$$\text{Moisture content (\%)} = \frac{M_2 - M_3}{\text{Loss in weight}} \times 100 \text{ i.e. } = \frac{M_2 - M_1}{\text{Initial weight of seed}} \times 100$$

Here,

M_1 = Weight of box with lid (g)

M_2 = Weight of box with lid and sample before drying (g)

M_3 = Weight of box with lid and sample after drying (g)

Result and Discussion

1. To study the effect of different treatments on infestation of groundnut pods by *Caryedon serratus* in storage

1.1 Number of eggs laid

The different seed treatments resulted in significant differences among the treatments with respect to the number of eggs laid by *Caryedon serratus* on stored groundnut pods. The data presented in

e. Germination percent (%)

The standard germination test was conducted (ISTA, 2020) by adopting the rolled paper towel between paper method in three replications of randomly drawn 400 seeds from each treatment. On 10th day of germination test (final count), number of normal seedlings were counted and calculated the germination percentage.

The moisture content is expressed as a percentage of the original weight (wet weight basis). i.e.

the table 1 showed that Neem seed oil, Spinosad 45% SC and Deltamethrin 2.8% EC treatments recorded no egg laying up to 9 months after treatment (MAT). At 12 MAT, the lowest number of eggs was recorded in Deltamethrin 2.8 % EC @ 0.4 ml/kg (5.33 eggs/100 pods), which was at par with Spinosad 45% SC @ 0.3 ml/kg (5.67 eggs/100 pods). Neem seed oil @ 10 ml/kg recorded 9.33 eggs/100 pods. The untreated control recorded the maximum egg laying (54.33 eggs/100 pods) at 12 MAT. The mean data revealed that Deltamethrin 2.8% EC @ 0.4 ml/kg recorded the lowest egg laying (1.33 eggs/100 pods), which was at par with Spinosad 45% SC @ 0.3 ml/kg (1.41 eggs/100 pods), while the neem seed oil @ 10 ml/kg recorded 2.33 eggs/100 pods. Untreated control recorded the maximum mean egg laying (28.16 eggs/100 pods).

Table 1. Effect of different treatments on number of eggs laid by *Caryedon serratus* on groundnut pods in storage.

Tr. No.	Treatments	Dose (ml per kg of seed)	Number of eggs laid (eggs/100pods)				Mean
			3 MAT**	6 MAT	9 MAT	12 MAT	
T ₁	Sunflower oil	10	0.00 (0.71)*	5.67 (2.48)	15.67 (4.02)	26.67 (5.21)	12.00 (3.10)
T ₂	Neem seed oil	10	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	9.33 (3.14)	2.33 (1.31)
T ₃	Castor seed oil	10	0.00 (0.71)	2.67 (1.78)	12.33 (3.58)	23.33 (4.88)	9.58 (2.73)
T ₄	Mustard seed oil	10	0.00 (0.71)	4.67 (2.27)	14.33 (3.85)	25.33 (5.08)	11.08 (2.97)
T ₅	Soybean oil	10	0.00 (0.71)	8.33 (2.97)	17.33 (4.22)	30.33 (5.55)	13.99 (3.36)
T ₆	Spinosad 45 % SC	0.3	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	5.67 (2.48)	1.41 (1.15)
T ₇	Deltamethrin 2.8 % EC	0.4	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	5.33 (2.42)	1.33 (1.13)
T ₈	Untreated control		4.33 (2.20)	21.33 (4.67)	32.67 (5.76)	54.33 (7.40)	28.16 (5.00)
	S.E(m)±		0.02	0.05	0.07	0.10	0.06
	CD @ 1%		0.10	0.23	0.31	0.44	0.27
	CV (%)		5.11	4.74	4.39	4.11	4.58

*Figures in parenthesis are $\sqrt{X + 0.5}$ transformed values. **MAT= Months After Treatment

1.2 Number of adults emerged

The data presented in the table 2 showed that, Neem seed oil @ 10 ml/kg recorded no adult emergence up to 9 months after treatment (MAT), whereas Spinosad 45% SC @ 0.3 ml/kg and Deltamethrin 2.8% EC @ 0.4 ml/kg completely prevented adult emergence throughout the storage period. At 12 MAT, neem seed oil recorded 6.67 adults/100 pods, while the untreated control recorded the maxi-

mum adult emergence (49.67 adults/100 pods). The mean data revealed that Spinosad 45% SC @ 0.3 ml/kg and Deltamethrin 2.8% EC @ 0.4 ml/kg recorded zero adult emergence, neem seed oil recorded 1.66 adults/100 pods whereas the untreated control recorded the maximum mean adult emergence (25.08 adults/100 pods).

Table 2. Effect of different treatments on number of adults emerged of *Caryedon serratus* on groundnut pods in storage

Tr. No.	Treatments	Dose (ml per kg of seed)	Number of adults emerged (adults/100pods)				Mean
			3 MAT**	6 MAT	9 MAT	12 MAT	
T ₁	Sunflower oil	10	0.00 (0.71)*	4.67 (2.27)	13.33 (3.72)	24.33 (4.98)	10.58 (2.92)
T ₂	Neem seed oil	10	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	6.67 (2.68)	1.66 (1.20)
T ₃	Castor seed oil	10	0.00 (0.71)	1.67 (1.47)	7.67 (2.86)	20.33 (4.56)	7.42 (2.40)
T ₄	Mustard seed oil	10	0.00 (0.71)	3.67 (2.04)	11.33 (3.44)	23.33 (4.88)	9.58 (2.77)
T ₅	Soybean oil	10	0.00 (0.71)	7.67 (2.86)	14.33 (3.85)	27.33 (5.28)	12.33 (3.18)
T ₆	Spinosad 45 % SC	0.3	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
T ₇	Deltamethrin 2.8 % EC	0.4	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
T ₈	Untreated control		3.33 (1.96)	19.67 (4.49)	27.67 (5.31)	49.67 (7.08)	25.08 (4.71)
	S.E(m)±		0.02	0.06	0.07	0.09	0.06
	CD @ 1%		0.12	0.25	0.29	0.39	0.26
	CV (%)		5.92	5.70	4.56	4.24	5.10

*Figures in parenthesis are $\sqrt{X + 0.5}$ transformed values. **MAT= Months After Treatment

1.3 Seed damage (%)

The data presented in the table 3 showed that Spinosad 45% SC @ 0.3 ml/kg and Deltamethrin 2.8% EC @ 0.4 ml/kg protected the seeds from insect damage throughout the storage period. Neem seed oil @ 10 ml/kg recorded no seed damage up to 9 months after treatment (MAT), whereas the untreated control recorded continuous seed damage throughout the storage period. At 12 MAT, Spinosad 45% SC and Deltamethrin 2.8% EC recorded zero seed damage, while neem seed

oil recorded 6.33 per cent seed damage. The untreated control recorded the maximum seed damage (15.67 %) at 12 MAT. The mean data revealed that Spinosad 45% SC @ 0.3 ml/kg and Deltamethrin 2.8% EC @ 0.4 ml/kg recorded zero seed damage, neem seed oil recorded 1.58 per cent seed damage whereas the untreated control recorded the maximum mean seed damage (8.08%).

Table 3. Effect of different seed treatments on groundnut seed damage (%) by *Caryedon serratus* in storage

Tr. No.	Treatments	Dose (ml per kg of seed)	Seed Damage (%)				Mean
			3 MAT**	6 MAT	9 MAT	12 MAT	
T ₁	Sunflower oil	10	0.00 (0.00)*	5.00 (12.92)	8.33 (16.78)	11.33 (19.67)	5.41 (11.14)
T ₂	Neem seed oil	10	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	6.33 (14.58)	1.58 (3.64)
T ₃	Castor seed oil	10	0.00 (0.00)	3.33 (10.52)	4.67 (12.48)	9.00 (17.46)	4.25 (10.11)
T ₄	Mustard seed oil	10	0.00 (0.00)	4.00 (11.54)	7.67 (16.07)	12.67 (20.85)	6.08 (12.11)
T ₅	Soybean oil	10	0.00 (0.00)	5.33 (13.35)	8.67 (17.12)	14.33 (22.25)	7.08 (13.18)
T ₆	Spinosad 45 % SC	0.3	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
T ₇	Deltamethrin 2.8 % EC	0.4	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
T ₈	Untreated control		1.33 (6.63)	5.67 (13.77)	9.67 (18.11)	15.67 (23.32)	8.08 (15.45)
	S.E(m)±		-	0.25	0.27	0.38	0.22
	CD @ 1%		-	1.05	1.16	1.60	0.95
	CV (%)		-	5.60	4.75	4.48	3.82

*Figures in parenthesis are arcsine transformed values. **MAT= Months After Treatment

1.4 Seed weight loss (%)

The data presented in the table 4 showed that Spinosad 45 % SC @ 0.3 ml/kg and Deltamethrin 2.8 % EC @ 0.4 ml/kg completely prevented seed weight loss throughout the storage period. Neem seed oil @ 10 ml/kg recorded no seed weight loss up to 9 MAT, whereas the untreated control recorded increasing seed weight loss during the storage period. At 12 MAT, Spinosad 45% SC and Deltamethrin 2.8% EC

recorded zero seed weight loss, followed by neem seed oil (0.87%). The untreated control recorded the maximum seed weight loss (8.13%) at 12 MAT. The mean data revealed that Spinosad 45% SC @ 0.3 ml/kg and Deltamethrin 2.8% EC @ 0.4 ml/kg recorded zero seed weight loss, whereas the untreated control recorded the maximum mean seed weight loss (3.47%).

Table 4. Effect of different seed treatments on groundnut seed weight loss in storage

Tr. No.	Treatments	Dose (ml per kg of seed)	Seed weight loss (%)				Mean
			3 MAT**	6 MAT	9 MAT	12 MAT	
T ₁	Sunflower oil	10	0.00 (0.00)*	1.33 (6.62)	2.94 (9.87)	5.27 (13.27)	2.38 (7.44)
T ₂	Neem seed oil	10	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.87 (5.34)	0.21 (1.33)
T ₃	Castor seed oil	10	0.00 (0.00)	0.54 (4.21)	1.54 (7.13)	2.12 (8.37)	1.05 (4.92)
T ₄	Mustard seed oil	10	0.00 (0.00)	0.67 (4.70)	2.84 (9.70)	5.35 (13.38)	2.21 (6.94)
T ₅	Soybean oil	10	0.00 (0.00)	1.67 (7.43)	3.38 (10.60)	5.62 (13.72)	2.66 (8.17)
T ₆	Spinosad 45 % SC	0.3	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
T ₇	Deltamethrin 2.8 % EC	0.4	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)

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Tr. No.	Treatments	Dose (ml per kg of seed)	Seed weight loss (%)				Mean
			3 MAT**	6 MAT	9 MAT	12 MAT	
T ₈	Untreated control		0.00 (0.00)	1.77 (7.65)	4.01 (11.55)	8.13 (16.57)	3.47 (8.94)
	S.E(m)±		-	0.05	0.08	0.12	0.06
	CD @ 1%		-	0.23	0.33	0.54	0.27
	CV (%)		-	2.53	2.28	2.53	1.83

*Figures in parenthesis are arcsine transformed values. **MAT= Months After Treatment

2. To study the effect of different treatments on seed storability of groundnut

2.1 Seed germination (%)

The data presented in the table 5 showed that seed germination gradually decreased with an increase in the storage period in all treatments. Deltamethrin 2.8% EC @ 0.4 ml/kg recorded the highest seed germination at 3, 6, 9 and 12 MAT, followed by Spinosad 45% SC @ 0.3 ml/kg. At 12 MAT, the highest seed germination was recorded in

Deltamethrin 2.8% EC (86.66%), which was followed by Spinosad 45% SC (85.67%) and neem seed oil (84.33%). The untreated control recorded the lowest seed germination (68.33%) at 12 MAT. The mean data revealed that Deltamethrin 2.8% EC @ 0.4 ml/kg recorded the highest seed germination (92.41%), followed by Spinosad 45% SC @ 0.3 ml/kg (91.67%), neem seed oil recorded (90.33%), whereas the untreated control recorded the lowest mean seed germination (82.43%). All treatments maintained the seed germination of above IMSC standards up to 12 MAT. While in control the germination fell below IMSCS at 12 MAT.

Table 5. Effect of different seed treatments on seed germination of groundnut in storage

Tr. No.	Treatments	Dose (ml per kg of seed)	Seed germination (%)				Mean
			3 MAT**	6 MAT	9 MAT	12 MAT	
T ₁	Sunflower oil	10	92.33 (73.93)*	87.67 (69.44)	82.00 (64.90)	72.33 (58.27)	83.58 (66.64)
			94.33 (76.23)	92.33 (73.93)	90.33 (71.89)	84.33 (66.68)	90.33 (72.18)
T ₃	Castor seed oil	10	93.33 (75.04)	90.33 (71.89)	85.67 (67.75)	73.33 (58.91)	85.66 (68.40)
			92.67 (74.29)	88.67 (70.33)	83.67 (66.16)	73.00 (58.69)	84.50 (67.37)
T ₅	Soybean oil	10	92.00 (73.57)	87.33 (69.15)	81.67 (64.65)	71.33 (57.63)	83.08 (66.25)
			95.00 (77.08)	92.67 (74.29)	93.33 (75.04)	85.67 (67.75)	91.67 (73.54)
T ₇	Spinosad 45 % SC	0.3	95.33 (77.52)	93.33 (75.04)	94.33 (76.23)	86.66 (68.58)	92.41 (74.34)
			91.66 (73.22)	86.67 (68.58)	82.67 (65.40)	68.33 (55.76)	82.43 (65.80)
T ₈	Untreated control		0.56	0.99	0.88	0.56	0.74
			2.35	4.19	3.72	2.38	3.16
			1.29	2.41	2.21	1.59	1.87

*Figures in parenthesis are arcsine transformed values. **MAT= Months After Treatment

2.2 Seed moisture content (%)

The data presented in the table 6 showed that moisture content gradually increased with an increase in the storage period in most of the treatments. Deltamethrin 2.8% EC @ 0.4 ml/kg recorded the lowest moisture content at 3, 6, 9 and 12 MAT, whereas the untreated control recorded comparatively higher moisture content throughout the storage period. At 12 MAT, the lowest moisture content was recorded in

Deltamethrin 2.8% EC (9.02%), followed by Spinosad 45% SC (9.06%) and neem seed oil (9.09%), while the untreated control recorded the highest moisture content (9.54%). The mean data revealed that Deltamethrin 2.8% EC @ 0.4 ml/kg recorded the lowest mean moisture content (8.84%), followed by Spinosad 45% SC @ 0.3 ml/kg (8.88%), neem seed oil recorded (8.93 %) whereas the untreated control recorded the highest mean moisture content (9.30%).

Table 6. Effect of different seed treatments on moisture content of groundnut in storage

Tr. No.	Treatments	Dose (ml per kg of seed)	Moisture content (%)				Mean
			3 MAT**	6 MAT	9 MAT	12 MAT	
T ₁	Sunflower oil	10	8.92 (17.38)*	8.91 (17.37)	9.13 (17.58)	9.25 (17.71)	9.05 (17.51)

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Tr. No.	Treatments	Dose (ml per kg of seed)	Moisture content (%)				Mean
			3 MAT**	6 MAT	9 MAT	12 MAT	
T ₂	Neem seed oil	10	8.77 (17.22)	8.87 (17.32)	9.01 (17.47)	9.09 (17.55)	8.93 (17.39)
T ₃	Castor seed oil	10	8.85 (17.31)	8.88 (17.33)	9.09 (17.55)	9.16 (17.62)	8.99 (17.45)
T ₄	Mustard seed oil	10	8.91 (17.37)	9.10 (17.55)	9.18 (17.64)	9.23 (17.69)	9.10 (17.56)
T ₅	Soybean oil	10	8.98 (17.44)	9.13 (17.58)	9.29 (17.74)	9.26 (17.72)	9.16 (17.62)
T ₆	Spinosad 45 % SC	0.3	8.68 (17.13)	8.85 (17.31)	8.96 (17.42)	9.06 (17.51)	8.88 (17.34)
T ₇	Deltamethrin 2.8 % EC	0.4	8.59 (17.05)	8.84 (17.30)	8.93 (17.39)	9.02 (17.48)	8.84 (17.30)
T ₈	Untreated control		8.93 (17.39)	9.28 (17.74)	9.47 (17.92)	9.54 (17.99)	9.30 (17.76)
	S.E(m)±		0.02	0.03	0.04	0.06	0.03
	CD @ 1%		0.10	0.13	0.17	0.27	0.16
	CV (%)		0.24	0.32	0.40	0.65	0.40

*Figures in parenthesis are arcsine transformed values. **MAT= Months After Treatment

The present investigation demonstrated that seed protectants effectively suppressed infestation of groundnut pods by *Caryedon serratus* during storage. Among the treatments, spinosad 45 % SC @ 0.3 ml kg⁻¹ and deltamethrin 2.8 % EC @ 0.4 ml kg⁻¹ were the most effective, while neem seed oil @ 10 ml kg⁻¹ was the most effective botanical. The reduction in egg laying may be attributed to the oviposition-deterrent, repellent and insecticidal properties of the treatments. The oil coating may also interfere with insect movement and respiration. Similar findings reported by Nadaf *et al.* (2010) [8], Spinosad and deltamethrin exhibited sustained efficacy throughout the study, ensuring zero pods with eggs and no pod damage along with complete inhibition of adult emergence for three months and emphasized the potential of both botanical and chemical protectants for effective bruchid management. Similarly, Harish *et al.* (2012) [17] reported that neem oil at 10 % concentration resulted in only 2.3 eggs per 100 g groundnut pods and was statistically at par with castor oil (2.5 eggs). Harish *et al.* (2012) [17] similarly recorded complete inhibition of adult emergence with neem and castor oils at 10 % concentration. Bhogesh *et al.* (2014) [10] reported spinosad 45 % SC as highly effective against *Caryedon serratus*, recording the lowest pod damage among insecticide treatments. Present findings were supported by Sakhare *et al.* (2018) [13], who observed that increased infestation by *Caryedon serratus* resulted in deterioration of stored groundnut physiological quality. Sharma *et al.* (2021) [18] similarly recorded minimum pod damage and weight loss with neem oil. Similarly, Singh *et al.* (2022) [19] demonstrated that the development and infestation of *Caryedon serratus* in stored groundnut as lower moisture content results in lower chances of infestation. Gundreddy *et al.* (2023) [20] further identified neem oil as the most effective botanical followed by castor oil against *Caryedon serratus* for seed damage.

Conclusion

The present study concluded that the different seed treatments significantly influenced the infestation and seed quality parameters of stored groundnut seeds against *Caryedon serratus*. Among the evaluated treatments, Deltamethrin 2.8 % EC @ 0.4 ml/kg and Spinosad 45 % SC @ 0.3 ml/kg provided effective protection by preventing egg laying, adult emergence, seed damage and seed weight loss throughout the storage period. Among the botanical treatments, neem seed oil @ 10 ml kg⁻¹ seed emerged as the most promising treatment. Deltamethrin recorded the highest mean seed germination followed by Spinosad, while neem seed oil @ 10 ml/kg proved to be the most effective botanical treatment. Deltamethrin 2.8 % EC @ 0.4 ml/kg

and Spinosad 45 % SC @ 0.3 ml/kg along with neem seed oil @ 10 ml/kg treatments maintained comparatively lower moisture content and better seed quality during storage. Therefore, Deltamethrin, Spinosad and neem seed oil demonstrated potential for managing groundnut bruchid infestation and maintaining seed quality under storage conditions.

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