The Pharma Innovation Journal 2023; 12(7): 2605-2608

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(7): 2605-2608

www.thepharmajournal.com
Received: 27-05-2023
Accepted: 02-07-2023

Adison Tandon
Department of Forest products and Utilization, College of Forestry, OUAT, Bhubaneswar, Odisha, India

Saswat Nayak
Department of Forest products and Utilization, College of Forestry, OUAT, Bhubaneswar, Odisha, India

Manoj Kumar Beck
Department of Agrometeorology, College of Agriculture, IGKV, Raipur, Odisha, India

Corresponding Author:
Adison Tandon
Department of Forest products and Utilization, College of Forestry, OUAT, Bhubaneswar, Odisha, India

Effect of storage condition and duration on oil content of *Schleichera oleosa* (Lour.) Oken Seeds

Adison Tandon, Saswat Nayak and Manoj Kumar Beck

Abstract
An experiment was conducted at the College of Forestry, Orissa University of Agriculture and Technology (OUAT), Bhubaneswar, India, to determine the effects of various storage conditions, such as closed light, closed dark, open light and open dark, as well as various storage durations, such as 0, 30, 60, 90, 120, and 150 days, on the oil content of *Schleichera oleosa* seeds. Oil content of seeds in closed polythene bags kept in light declined from 51.90% at the time of storage of seeds after 150 days to 30.39%, showing minimum degradation of 41.44%. The best storage environment for long-term storage of *Schleichera oleosa* seed for oil content is a closed polythene bag under light. This will help to minimise the oil's degradation.

Keywords: Degradation, storage, *Schleichera oleosa* seeds, oil content

Introduction
Schleichera oleosa (Lour.) Oken is a commercially important tree species belonging to the Sapindaceae family. It is also referred as *Schleichera trijuga* Wild and locally known as "*Kusum*" (Hindi) and "*Kusum*a" (Oriya). Kusum is a native species of tropical Asian countries and from the Sutlej to Chottanagpur regions, it is dispersed throughout the Himalayan foothills, encompassing the states of Jharkhand, Bihar, Chhattisgarh, Odisha, Madhya Pradesh, and Andhra Pradesh. Other than India the tree is distributed in countries like Nepal, Sri Lanka, Myanmar, Thailand, Indonesia and Malaysia (Saha *et al*., 2010) [10]. The tree is normally found in mixed deciduous forests, often of a somewhat dry type (The wealth of India). It typically grows at low elevations; however, it can be found up to 900–1200 m. The normal rainfall ranges from 750 to 2800 mm, while the absolute minimum and maximum temperatures range from 2.5 °C- 5.0 °C and 35 °C -47.5 °C respectively (Kundu and Schmidt, 2011) [7]. The leaves measure 20–40 cm in length and are alternately pinnate. The flowers are tiny, bisexual or male, yellowish green, and fascicled in spike-like, axillary racemes that are 7.5 to 12.5 cm long. The fruits are berry, globose or ovoid, and hard skinned. The seeds are brown, irregularly elliptic, slightly compressed, oily, enclosed in a succulent aril. Fruits are simple, fleshy and of 'Berry' category which is either one seeded or two seeded. The weight of 1000 seeds is 500—700 g. It's flowering and fruiting starts from March to July. The seeds are of orthodox type and can be kept for a long time if they are kept at a low temperature (-20 °C to 15 °C) and low moisture content (5-7%). Viability of seed is short at ambient temperature, if moisture content of seed is not maintained to 5-7 percent. Germination starts within 15 days and is completed in 30 days (Kundu and Schmidt, 2011) [7].
The oil obtained from its seeds is called Kusum oil and its content in the seed kernel varies from 59–72%. It is generally used for culinary, soap making and lighting purpose. The oil from seeds can be used for the production of biodiesel. Besides that, the oil is used for medicinal purposes for curing of itch, acne, burns, other skin diseases, rheumatism, hair dressing and promoting hair growth. It also possesses antimicrobial, antioxidant, anticancer activity. Recently, it was also reported that the bark along with water is used to treat menorrhea. In India, it is widely used as a host for the lac insect *Laccifer lacca* (Karr). for production of kusumi lac and in parts of southern India, it is a prominent bee plant for nectar (Srivastava and Pandey, 2012) [12].

Material and Methods
The experiment was carried out at College of Forestry, Orissa University of Agriculture and Technology (OUAT), Bhubaneswar.

Seeds were collected from selected plus tree of Chhattisgarh seed source named as CGPST-5 during month of July 2015. The air-dried seeds (100g) were then stored in polythene bags under various storage condition such as Closed light, Open light, Closed dark, Open dark as well as various storage durations, such as 0, 30, 60, 90, 120, 150 days respectively. According to the treatment, the seeds were removed from varied storage conditions and times. After that, in each case of treatment, the kernels and seeds are separated. With the use of a knife, 50 g of kernel were divided into smaller pieces, which were then ground and reduced to a suitably fine meal in a pestle mortar. The ground samples are then placed in the thimble in the extraction chamber of Soxhlet apparatus. Petroleum ether was used as the extraction solvent, and the extraction chamber was mounted over a round bottom flask. Then a condenser was fitted over the extraction chamber of Soxhlet apparatus. The Soxhlet apparatus was kept over the heating element and allowed to heat at 30^0C. The petroleum ether began to boil when the temperature reached its boiling point. As it boiled, it first evaporated, then condensed, and finally fell into the thimble containing the ground kernel. By dropping heated Petroleum ether on the kernel in the thimble, the oil was extracted. The mixture of extracted oil and petroleum ether was syphoned out of the extraction chamber after it had reached its maximum level and returned to the round bottom flask. The extraction process was repeated 15 times, or until there was no longer any oil visible in the solvent in the extraction chamber. The mixture of petroleum ether and oil in the round-bottom flask was taken out and distilled until there was no more petroleum ether in the flask containing the oil. The flask was left till it cooled, after which the weight of the flask containing the oil was measured. Calculations were made based on the oil extracted to determine the percentage of oil content and the percentage of oil deterioration.

W_1- Weight of the empty flask in g.

W_2- Weight of flask with oil in g.

$$\text{Percentage of oil content (On kernel weight basis)} = \frac{W_2 - W_1}{W_3} \text{ X } 100$$

Calculation

Percentage of oil degradation was calculated for each treatment with the decrease in oil content for that treatment with respective to the oil content at 0 days.

The experiment was designed in completely randomizd design (CRD) and replicated thrice. According to Snedecor and Cochran's second edition of 1980, statistical analysis was performed on the observed data. The statistical programme MStatC was used to analyse the data.

Result and Discussion

The experiment's findings were evaluated to determine that storage time has a significant effect on the seed oil content of *Schleichera oleosa* (Lour.) Oken. As storage duration increased in all storage conditions, the oil content of the seeds decreased significantly. The mean oil content (averaged for four storage condition) was maximum (51.90%) at the time of storage of seeds and minimum (26.54%) after 150 days with maximum degradation (48.86%). This could be the outcome of oil deterioration brought on by the oxidation process between unsaturated fatty acids and oxygen (Table 1, Figure 1). The rate of oxidation increases with the increase in duration of exposure to air during storage period. The oxidation of oil requires the presence of atmospheric oxygen, the availability of oxygen increases with storage time and vice versa. This could explain why the oil content of seeds that have been stored for various amounts of time has decreased. During storage, seeds undergo metabolism to produce energy for their physiological functions and higher activity of storage fungi which increase the free fatty acids may be the other reasons for the seed oil reduction during long storage period.

Table 1: Effect of different storage conditions and duration on oil content (%) of seed kernels of seeds of *Schleichera oleosa* (Lour). Oken

Storage Condition	Storage Duration						Mean
	0 Days	30 Days	60 Days	90 Days	120 Days	150 Days	
Closed polythene bag kept in light (CLL)	51.90	46.32	41.80	36.61	33.56	30.39	40.1
Open polythene bag kept in light (OPL)	51.90	45.28	40.42	34.36	31.75	28.35	38.68
Closed polythene bag kept in dark (CLD)	51.90	44.65	39.24	34.55	29.65	25.28	37.55
Open polythene bag kept in dark (OPD)	51.90	46.00	40.77	34.92	29.10	22.14	37.47
Mean	51.90	45.56	40.56	35.11	31.02	26.54	
Storage Condition- CD at 5% - 0.094; Storage Duration - CD at 5% - 0.115, Interaction - CD at 5% - 0.230							

The outcome seen in this study is consistent with Sisman (2005) [11]. Sisman and Delibas (2004) [11] reported that Sunflower seeds were stored for three months, and as storage time increased, the percentage of seed oil gradually decreased. Similar findings were reported by Ghasemezhad *et al.* (2007) [5], who found that as storage time increased, the percentage of oil rapidly decreased. According to Ahmadkhan *et al.* (2000) [1] and Morello *et al.* (2004) [8], the main factor contributing to oil deterioration and reduction during storage is the formation of rancidity caused by the lipids in vegetable oil degrading under the influence of oxygen. According to Suriyong (2007) [13], the oxidation process, which occurs when an unsaturated fatty acid reacts with oxygen, is the cause of oil deterioration. Ghasemnezhad and Honermeier (2009) [6] mentioned that the metabolism of the seed has also been a potential factor in the loss of seed oil during prolonged storage of the seed.

The mean oil content (averaged over storage period of 150 days for each storage condition) was maximum in seed storage in closed polythene bag kept in light (40.10%) with minimum degradation (22.73%) which was followed by open polythene bag kept in light (38.68%), closed polythene bag kept in dark (37.55%) and minimum in open polythene bag kept in dark (37.47%) with maximum degradation of oil content (27.79%) (Table-1 & Fig-1).

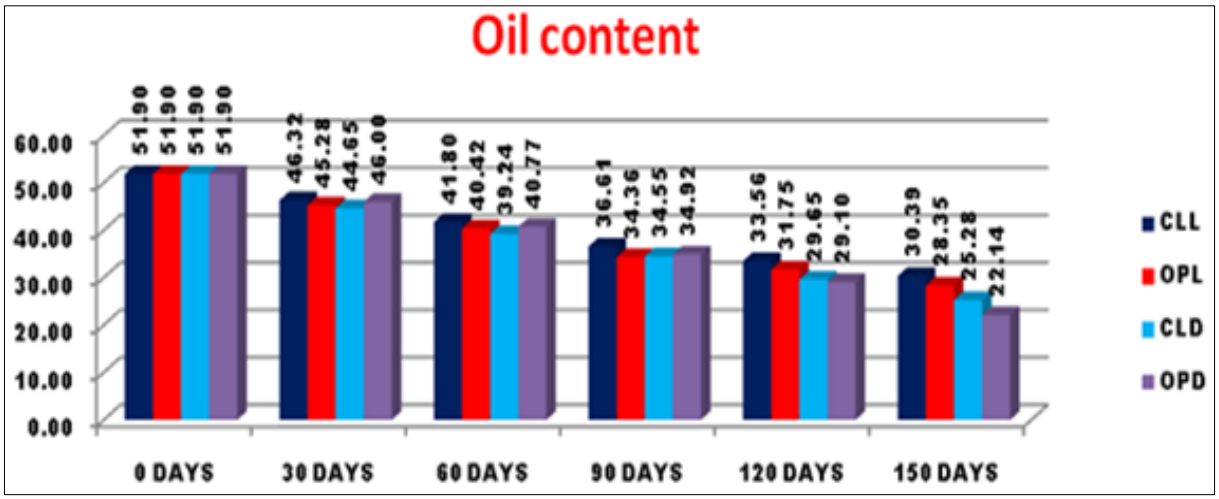

Fig 1: Effect of different storage conditions and duration on oil content (%) of kernels of seeds of *Schleichera oleosa* (Lour) Oken.

Table 2: Effect of different storage conditions and duration on degradation in oil content of seeds of *Schleichera oleosa* (Lour) oken

Storage Condition	Storage Duration						Mean
	0 Days	30 Days	60 Days	90 Days	120 Days	150 Days	
Closed polythene bag kept in light (CLL)	0.00	10.75	19.40	29.46	35.33	41.44	22.73
Open polythene bag kept in light (OPL)	0.00	12.75	22.11	33.79	38.82	45.37	25.47
Closed polythene bag kept in dark (CLD)	0.00	13.97	24.39	33.42	42.87	51.29	27.65
Open polythene bag kept in dark (OPD)	0.00	11.37	21.44	32.71	43.93	57.34	27.79
Mean	0.00	12.21	21.84	32.35	40.24	48.86	
Storage Condition- CD at 5% - 0.228; Storage Duration-CD at 5% - 0.280, Interaction- CD at 5% - 0.559							

The minimum oil content (37.47%) was obtained in the seeds stored in open polythene bags kept in dark with maximum degradation of oil content (27.79%) which may be due to the combined effect of atmospheric temperature of the storage condition, moisture maintained in the dark storage place and moisture content of the seeds favoring enzymatic and non-enzymatic auto oxidation of lipids which occurs at higher storage temperature, relative humidity and higher seed moisture content. Maximum oil content (46.32%) found in seed stored in closed polythene bag kept in light after 30 days with less degradation of 10.75% in oil content because of less contact with atmospheric humidity and oxygen which do not favour in the hydrolysis of triglycerides to fatty acids and also not favouring fungal decay, ultimately not affecting the degradation of oil (27.79%) (Table-2 & Fig-2).

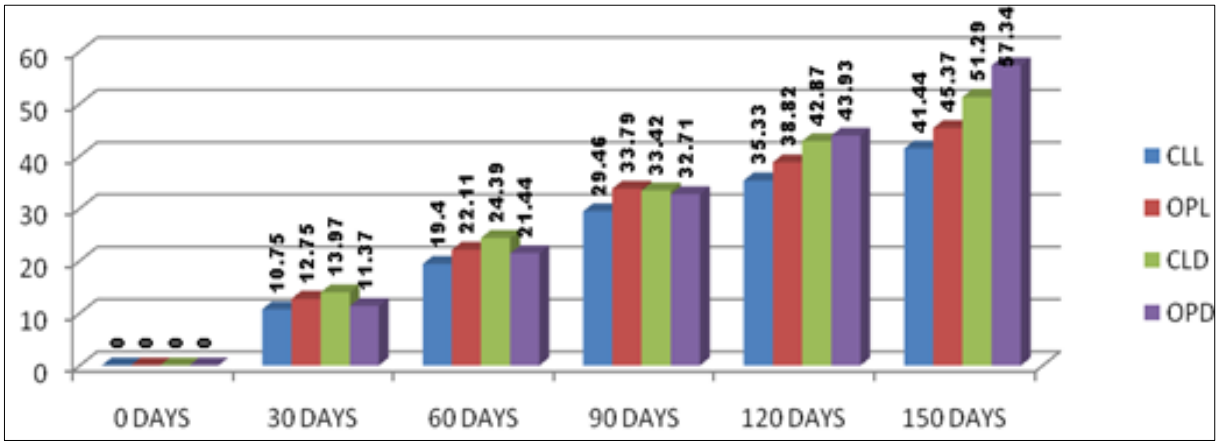

Fig 2: Effect of different storage conditions and duration on oil degradation of seeds of *Schleichera oleosa* (Lour) oken.

The experiment on the fluctuation of oil content in various storage conditions in *Schleichera oleosa* has not been conducted before, but similar research have been done in other oil seeds. These findings from the study are also consistent with with Trawatha *et al.* (1995) [15] and Balasevic-Tubic *et al.* (2005) [2] which shows the primary factor causing the rapid deterioration of oil seeds is the auto-oxidation of lipids and increase in free fatty acid concentration in seed oil crops like soyabean and sunflower. It has been suggested by Canakei (2007) [4] that the unsaturated fatty acid component of jatropha is easily oxidised, which may contribute to the deterioration of the oil. Ahmadkhan and Shahidi (2000) [1] claim that the degradation rate of various fatty acids that convert to one another determines the fatty acid content and proportion of oil seeds during storage. The rise in fatty acids is connected to the increase in moisture content of the seeds, which is affected by oxygen and ambient humidity during storage. This is consistent with Berchmans and Hirata (2008)

[3] findings, which indicated that the hydrolysis of triglycerides in the presence of moisture and oxygen increased the amount of free fatty acids.

Conclusion

Based on the findings of the experiment, it was determined that the storage condition and duration had an impact on the oil content of Scheichera oleosa seeds. In seeds stored in closed polythene bags kept in light for 30 days, the maximum oil content on a kernel weight basis (46.32%) and the minimum oil degradation (10.75%) were recorded. Then the seeds stored in an open polythene bag kept in the dark for 150 days had the minimum oil content (22.14%) and the maximum oil degradation (57.34%). The study indicated that seeds of Scheichera oleosa should be stored in closed polythene bags kept in light for a long time, in order to minimize the degradation of oil.

References

1. Ahmadkhan M, Shahidi F. Oxidative stability of stripped and no stripped Borage and evening primorose. Oil and their emulsions in water. Journal of Am. oil chem. soc. 2000;77(9):963-968.
2. BalaSevic-Tubic SD, Malencic M, Tatic, Miladinonic J. Influence of aging process on biochemical changes in Sunflower seed. Helia. 2005;28(42):107-114.
3. Berchmas HJ, Hirata S. Biodisel production from crude *Jatropha curcas* L. seeds oil with high content of free fatty acids. Bioresources Technology. 2008;79:1716-1721.
4. Canakei M. The potential of restaurant waste lipids as biodiesel feed stocks. Bioresource Technology. 2007;98(1):183-190.
5. Ghasemnezad A, Cergel S, Honermeier B. The impact of storage time and storage temperature on the quality of the oil of evening primrose (*Oenothera biennis* L.). Journal of Medicinal and spice plants. 2007;12(4):175-180.
6. Ghasemnezad A, Honermeier B. Influence of storage conditions on quality and viability of high and low oleic sunflower seeds. International Journal of Plant Production. 2009;3(4):39-48.
7. Kundu M, Schmidt LH. *Schleichera oleosa* (Lour) Oken. Seed Leaflet, 2011, (153).
8. Morello JR, Motilva MJ, Tovar MJ, Romero MP. Changes in commercial virgin olive oil (CV Hrbequina) during storage with special emphasis on the phenolic fraction. Journal of Food chemistry. 2004;85:357:364.
9. Rout S, Nayak S. Influence of Storage Condition and Duration on Oil Content of *Pongamia pinnata* L. Pierre. Seeds. Online International Interdisciplinary Research Journal; c2015. p. 139-144.
10. Saha D, Ramani R, Bamboo B. Kusum Multipurpose tree, Yet not popular. Science Reporter, Feb 2010.
11. Sisman C, Delibas L. Storing sunflower seed and quality losses during storage. Journal of Central European Agriculture. 2004;4:239-250.
12. Srivastava A, Pandey G. Starch and Glucose Content and Changes therein in the Seeds of *Schleichera oleosa* (Kusum) due to Bioterioration by Pathogenic Fungi during Storage. International Journal of Recent Trends in Science and Technology. 2012;4:05-08.
13. Suriyong S. Studies about mechanisms of oil seed deterioration under different storage conditions in oil seed rape (*Brassica napus* L.) Cuvillier verlag Gottingen; c2007. p. 2.
14. Thapliyal M, Tewari R. Seed germination response to pretreatments and storage behaviour in *Schleichera oleosa* (Lour.) Oken – Indian lac tree. Forests, Trees and Livelihoods. 2011;20:295–300.
15. Trawatha SE, Tekrony DM, Hildebrand DF. Relationship on soybean quality to fatty acid and C_6-aldehyde levels during storage. Crop sci. 1995;35:1415-1422.