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Agro-Climatic Influence on Seed Characterisation and Kernel Powder Yield in Tamarind (*Tamarindus Indica* L.)

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Abstract

An experiment was conducted to study the seed coat to kernel ratio and Tamarind Kernel Powder (TKP) outturn in different agro-climatic zones *viz*., North-western zone, Cauvery-delta zone, Southern zone, Western zone and North-eastern zone of Tamil Nadu, India. Among the five agro-climatic zones, the kernel (Endosperm) content was maximum (82.48%) in North-western zone and minimum (69.94%) in Cauvery-delta zone and vice versa in seed coat content. The kernel was pulverised and it was subjected for tamarind kernel powder outturn (TKP). The tamarind kernel powder (TKP) outturn was exhibited highest in North-western zone (80.42%) and lowest in Cauvery-delta zone (62.68%). On concluding the study, the North-western zone bestow maximum in kernel content in seed and tamarind kernel powder outturn, so hence it can be recommended for tamarind kernel powder yield in seed raised plantation.

Keywords

Agro-climatic zones Kernel; Seed coat; Tamarind kernel powder; Tamarind Seed.

Introduction

In the recent years, there has been a steady increase in the potentials of the world's plant resources and many investigations are screening towards new applications in science and industry. Among these plant resources and wealth, tamarind has been well known in India, since ancient times for uses. Tamarind (*Tamarindus indica* L.) is a multipurpose tropical fruit tree used primarily for its fruits and seeds processed for non-food uses. Tamarind is a long-lived, large, evergreen or semi-evergreen tree, 20–30 m tall with a thick trunk up to 1.50–2.00 m across and up to 8.00 m in circumference. Tamarind thrives under a maximum annual temperature ranging from 33–37°C to a minimum of 9.50–20.00°C and grows well in loamy, deep and well drained alluvial soil.

Especially, the tamarind seed based products are gaining more importance in textiles and pharmaceuticals industries due to its binding and sizing properties. The tamarind seed is used for preparation of tamarind kernel powder. It is prepared by decorticating the seed and pulverising the creamy white kernels. The decorticated seed is ground by machines to the required mesh size for obtaining a yield of 55–60 percent. The powder tends to deteriorate during storage under humid conditions; hence storage in a dry place under

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moisture proof containers is important. Mixing with 0.5 percent of sodium bisulphite before packing will prevent enzymatic deterioration (Reddy *et al*., 2013). The characteristic of a good tamarind seed powder is that it should have flavouring, when dissolved in water and be free of any burnt or other undesirable flavours, good keeping quality and free from any insect pests, fungal growth or extraneous materials. In India, TKP is used as a source of carbohydrate for the adhesive or binding agent in paper, textile sizing, weaving, jute products as well as textile printing (Khoja and Halbe, 2001).

Tamarind seed gum (TSG) is a new formulation derived from the tamarind kernel powder. The main component of tamarind seed gum was identified as a non-ionic, neutral, branched polysaccharide consisting of a cellulose-like backbone that carries xylose and galacto xylose substituents (Pongsawatmanit *et al*., 2006). In conformity with the above principle, the study was aimed to study the influence of agro-climatic zone of Tamil Nadu on seed properties and tamarind kernel powder outturn.

Material and Methods

The tamarind fruits and seeds collected in different agro-climatic zones *viz*., North-western zone, Cauvery-delta zone, Southern zone, Western zone and North-eastern zone of Tamil Nadu. The tamarind pods collected from different agro-climatic zones were processed and analysed at Forest College and Research Institute, Mettupalayam during 2016 - 2018. Survey has been made to collect tamarind fruits from 5 different agro-climatic zones, where one kilogram of pod from each zone was taken for pod fractionation. The pods were broken carefully and fractionated into pod shell, fibre, pulp and seed. Freshly collected fruits were de-pulped and seeds were separated from the rind of the fruits carefully. The seeds collected were cleaned and washed in water to remove all the foreign materials. The seeds obtained through pod fractionation in five agro-climatic zones were used for studying the tamarind seed coat to kernel content and tamarind kernel powder outturn.

Removal of testa from the seed is a difficult process, the testa was tenaciously held to the endosperms and it should be removed without damage to endosperm. The peeling of testa from the seeds was done by standardised decortication process. The content of seed kernel to testa was estimated by the formula described by Doucette *et al.* (2001) and expressed a percentage.

$$\text{Seed recovery (\%)} = \frac{\text{Weight of the seed at outlet}}{\text{Total weight of the seed lot}} \times 100$$

After the separation of seed coat form seed, the endosperm obtained was subjected for preparation of tamarind kernel powder. The decorticated endosperm was pulverised and tamarind kernel powder was prepared. The quantity of tamarind kernel powder (TKP) obtained from 1 kg. of seed reflects the powder yield. During the present study, 1 kg. of cleaned tamarind kernel was taken and subjected for grinding then the quantity of tamarind kernel powder obtained was estimated by the formula followed by Thyagarajan (1996) as described below. The values were expressed in percentage.

$$\text{Tamarind kernel powder (\%)} = \frac{\text{Weight of the seed powder at outlet}}{\text{Total weight of the seed lot}} \times 100$$

The experimental data were subjected to statistical analysis by comparative analysis through Duncan's multiple range test (DMRT) was statistically analysed by using XLSTAT in Microsoft excel.

Results and Discussion

In tamarind, the seed comprises with seed coat content of 20–30 percent and the endosperm of 70-75 percent as reported by Coronel (1991). Among different agro-climatic zones, maximum seed coat was accounted in Cauvery delta zone with the value of 30.06 percent followed by Western zone with the content of 28.71 percent and the minimum (17.52%) in North western zone. On supporting the present research result, Estevez *et al*. (2012) reported that *Prosopis chilensis*, *Caesalpipinea spinosa* and *Gleitisa triacanthos* observed seed coat content of 26.7 percent, 25.3 percent and 25.5 percent respectively.

Normally the legume plants had maximum endosperm content in seeds, which are utilized for polysaccharides as an energy and water reserve (Pollard *et al*., 2010). In present study, North western zone contributed highest endosperm content of 82.48 percent and lowest in Cauvery delta zone with the content of 69.94 percent (Table 1). In tamarind, the endosperm contains gel forming polysaccharide, which is called as jellose. The present help to conclude that maximum endosperm content in seeds can be recommended

for maximum tamarind kernel powder outturn and tamarind seed gum yield.

Table 1: Seed coat to kernel content of tamarind seeds from different agro-climatic zones of Tamil Nadu

Sl. No.	Agro-climatic zones	Seed coat (%)	Kernel (%)
1	North western	17.52^{d}	82.48^{a}
2	zone	30.06^{a}	69.94^{d}
3	Cauvery delta zone	21.98^{c}	78.02^{b}
4	Southern zone	28.71^{ab}	71.29^{cd}
5	Western zone	26.66^{b}	73.34^{c}
	North eastern zone		

Note: The same letter in a column is not significantly different at 5% level

In tamarind kernel powder, North western zone recorded highest TKP of 80.42 percent followed by Southern zone with 77.53 percent and lowest (62.68%) in Cauvery delta zone (Table 2 and Fig. 1).

Table 2: Effect of different agro-climatic zones on tamarind kernel powder outturn from 1 kg. of seed

Sl. No.	Agro-climatic zone	Tamarind kernel powder (%)
1	North western zone	80.42^{a}
2	Cauvery delta zone	62.68^{e}
3	Southern zone	77.53^{b}
4	Western zone	70.17^{c}
5	North eastern zone	67.90^{d}

Note: The same letter in a column is not significantly different at 5% level

The study result of Lokesh *et al*. (2014) in tamarind using dehulling process in tamarind seeds confirms the present research findings. Similar findings were reported by Klahal *et al*. (2013) on estimation of tamarind kernel powder from different places, he recorded tamarind kernel powder from different sources with the value of 79.97 percent in Uthaithani, 78.82 percent in Ang Thong, 78.63 percent in Nkhon Sawhon and 81.62 percent in India. Hence, the present study result help to conclude that tamarind kernel powder outturn had greater influence of seed sources (Agro-climatic zones).

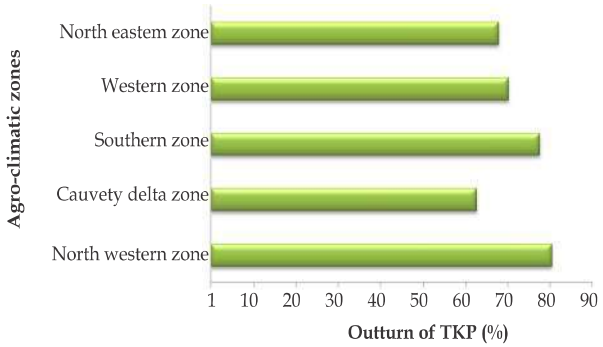

Fig. 1: Effect of different agro-climatic zones on outturn of tamarind kernel powder

Conclusion

North western zone was found superior in kernel content of seed and tamarind kernel powder (TKP) outturn in tamarind plantation. However, the Cauvery delta zone was poorly performed in kernel content of seed and tamarind kernel powder (TKP) outturn and hence this agro-climatic zone should be avoided during TKP production.

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