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## Variation of fatty oil content in different populations of *Mallotus nudiflorus* (L.) Kulju & Welzen occurring in diverse agro climatic zones of Assam

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### Abstract

*Mallotus nudiflorus* (L.) Kulju & Welzen is a medium sized deciduous tree under the family Euphorbiaceae with Nativity from the Himalaya to Hainan Island. In India it is distribution throughout the hotter parts, moist semi-evergreen tropical forests along river and water courses. The plant is traditionally used in Indian Ayurvedic medicine. Lipid classes and fatty acid compositions of seed oil considered a cheap raw material in surface coating industry. The present study investigated the variation of fatty oil content of *M. nudiflora* from populations of different agro climatic zone of Assam. Five Agro climatic zone of Assam were selected, extensive field surveys were done for authentication of extent of population and distribution maps were prepared accordingly. Twenty (20) populations were studied; fruits were de pulped and pale yellow coloured oil was extracted with Soxhlet apparatus using hexane as solvent. The highest percentage of oil found in Bilasipara population ( $25.12 \pm 0.17\%$ ) of Lower Brahmaputra Valley Zone, and lowest in Kolajan of North Bank Zone ( $1.51 \pm 0.52\%$ ). Diversity in specific climato-ecological characteristics of agro climatic zones influenced the variation in oil content of studied populations. Present results facilitated a great opportunity intended for selection of superior population in favour of obtaining high fatty oil yield from seeds *M. nudiflorus* at commercial scale.

**Keywords:** Fatty oil, different populations, agro climatic zones, Assam, *Mallotus nudiflorus*

### Introduction

*Mallotus nudiflorus* (L.) Kulju & Welzen (*Trewia nudiflora* Linn.) is a medium sized deciduous tree under the family Euphorbiaceae with Nativity from the Himalaya to Hainan Island. In India it is distributed throughout the hotter parts, moist semi-evergreen tropical forests along river and water courses. Plant up to 20 m high, young parts tomentose, wood is soft. Leaves simple, opposite, decussate; lamina 6-20 x 9-15 cm, broadly ovate-cordate with prominent 3-ribbed from base; flowers dioecious, unisexual, greenish- yellow; male flowers long catkin like racemes; female flowers 4-5 on axillary racemes; fruit woody, globose, drupe dark brown in colour, pericarp very thick, seeds globose, black polished, flowering period from January to March and fruiting August –September (Figure-1). The plant is traditionally used in Indian Ayurvedic medicine for the treatment of rheumatism, arthritis and gastritis. Freedman *et al.*, (1982) <sup>[1]</sup> tested ethanol extract of seed for controlling some important insects. The seed oil, showed antimicrobial bioassay against *Mycobacterium tuberculosis* (Guo-Hong *et al.*, 2004) <sup>[2]</sup>. Zhao and Shen, (2004) <sup>[3]</sup> reported that a high potential of the fatty oil of *M. nudiflora* from its fruits and anti-ulcerogenic effect of leaves for use in pharmaceutical industry. Smith *et al.* (2013) <sup>[4]</sup> gave a statement that triacylglycerol estolides as components of the seed oil and associated with the presence of fatty acids containing hydroxyl groups. Earlier Madrigal and Smith (1982) <sup>[5]</sup> also reported glycerides of  $\alpha$ -kamlolenic acid in the seeds of *M. nudiflora*. The present study was framed to investigate the variation of fatty oil content of seeds of *M. nudiflora* from different agro climatic zone of Assam and selection of superior population with respect to obtain high yield.

### Materials and Methods

Five Agro climatic zones of Assam namely Upper Brahmaputra valley Zone, Hill Zone, North Bank Zone, Central Brahmaputra Valley Zone and Lower Brahmaputra Valley Zone were

selected for analysis of fatty oil content. Extensive field surveys were done and detailed geo coordinates were recorded for authentication of extent of distribution. Twenty numbers of populations were selected with 15 accessions and three replications for the analysis. Fully mature fruits were collected during the month of August- September, de pulped the fruits to obtain seeds and ready for fatty oil extraction.

Seeds were crushed with an iron mortar and oil was extracted with Soxhlet apparatus by using hexane as solvent (40-60°C) for about 8 hours. The extracted solvent was removed by using rotary vacuum evaporator under reduced pressure and calculated the percentage of the oil content. Moisture content of the seeds, Oil weight (g), and Yield percentage of oil were calculated. Physical characteristics of oil were recorded.

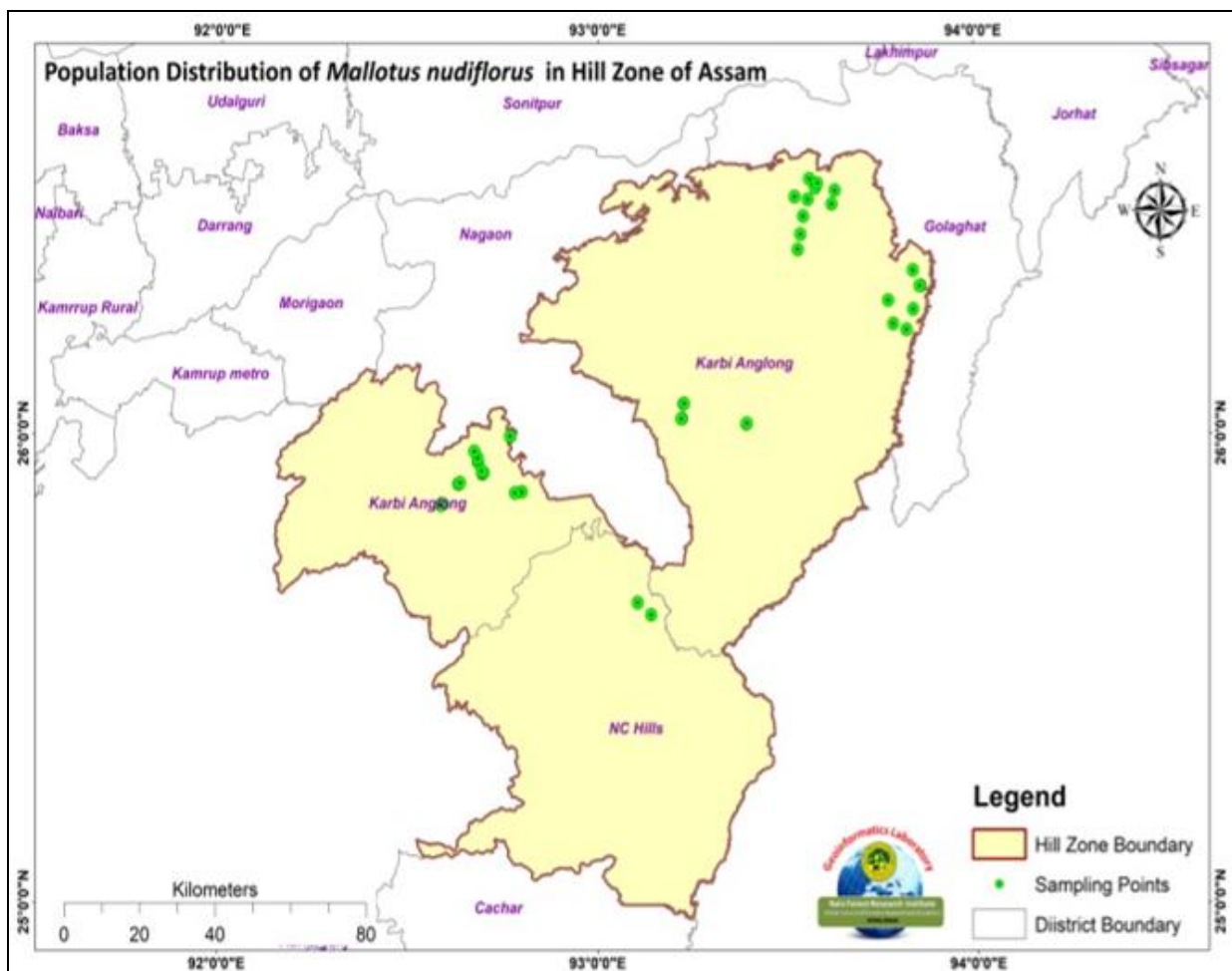
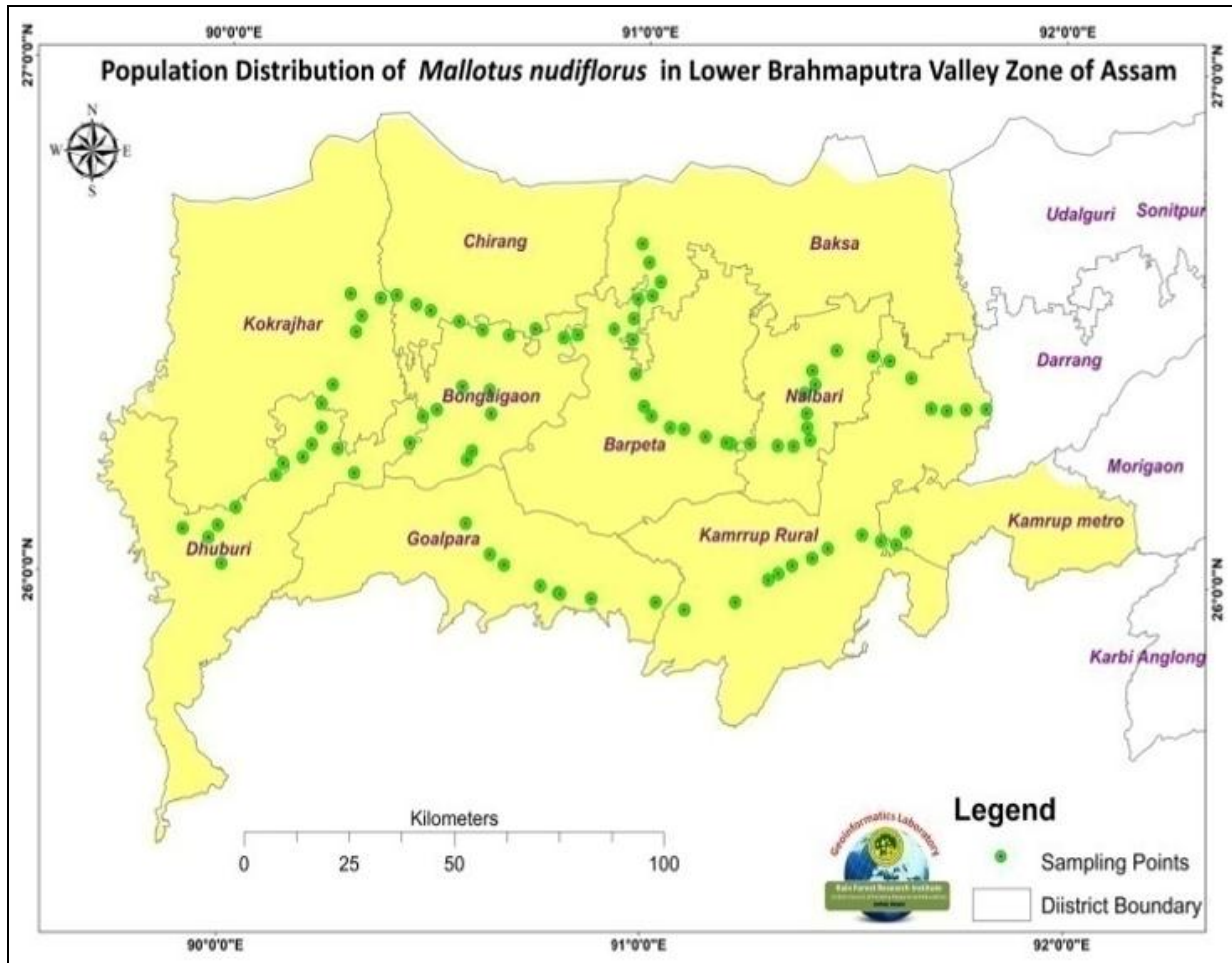


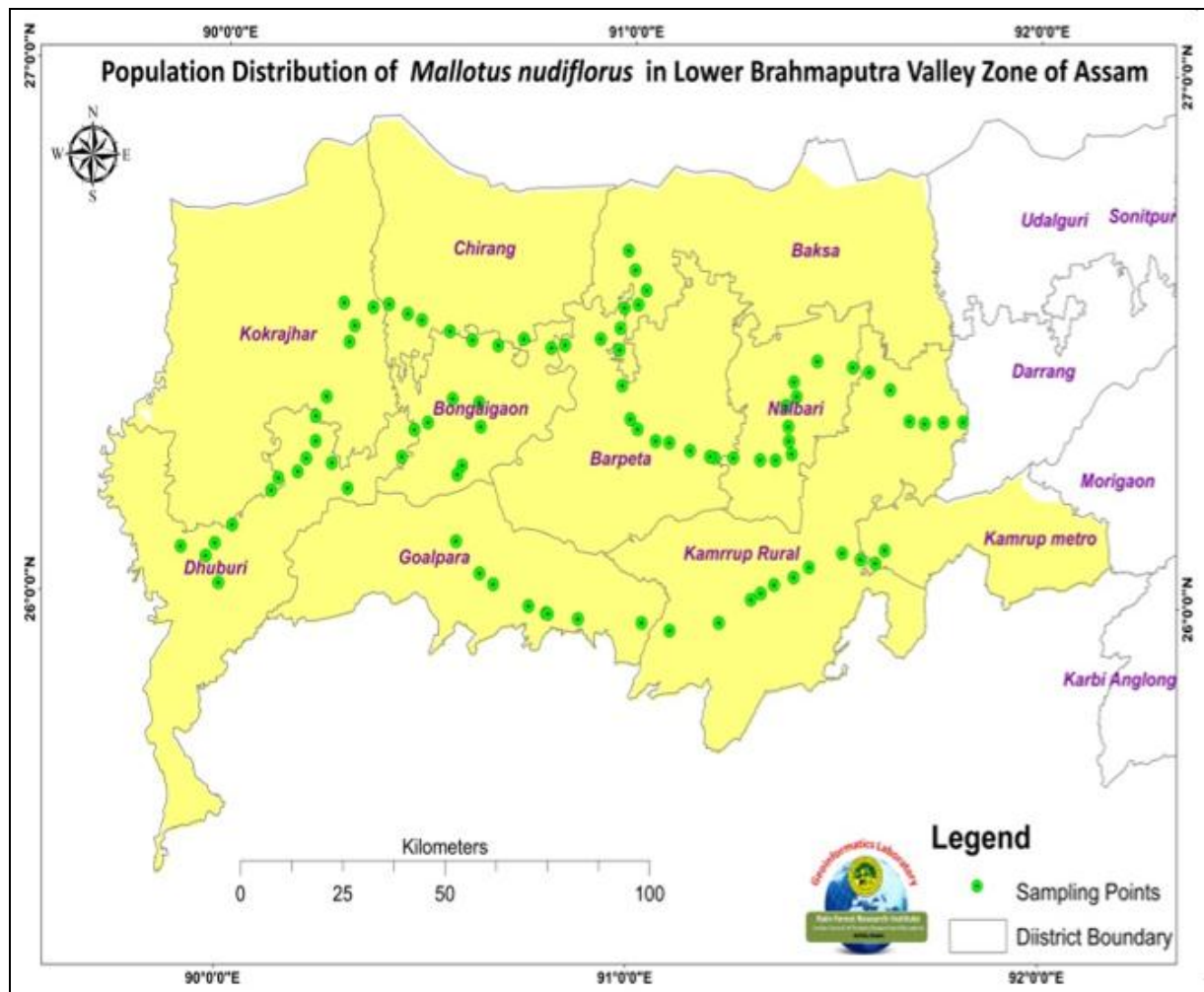
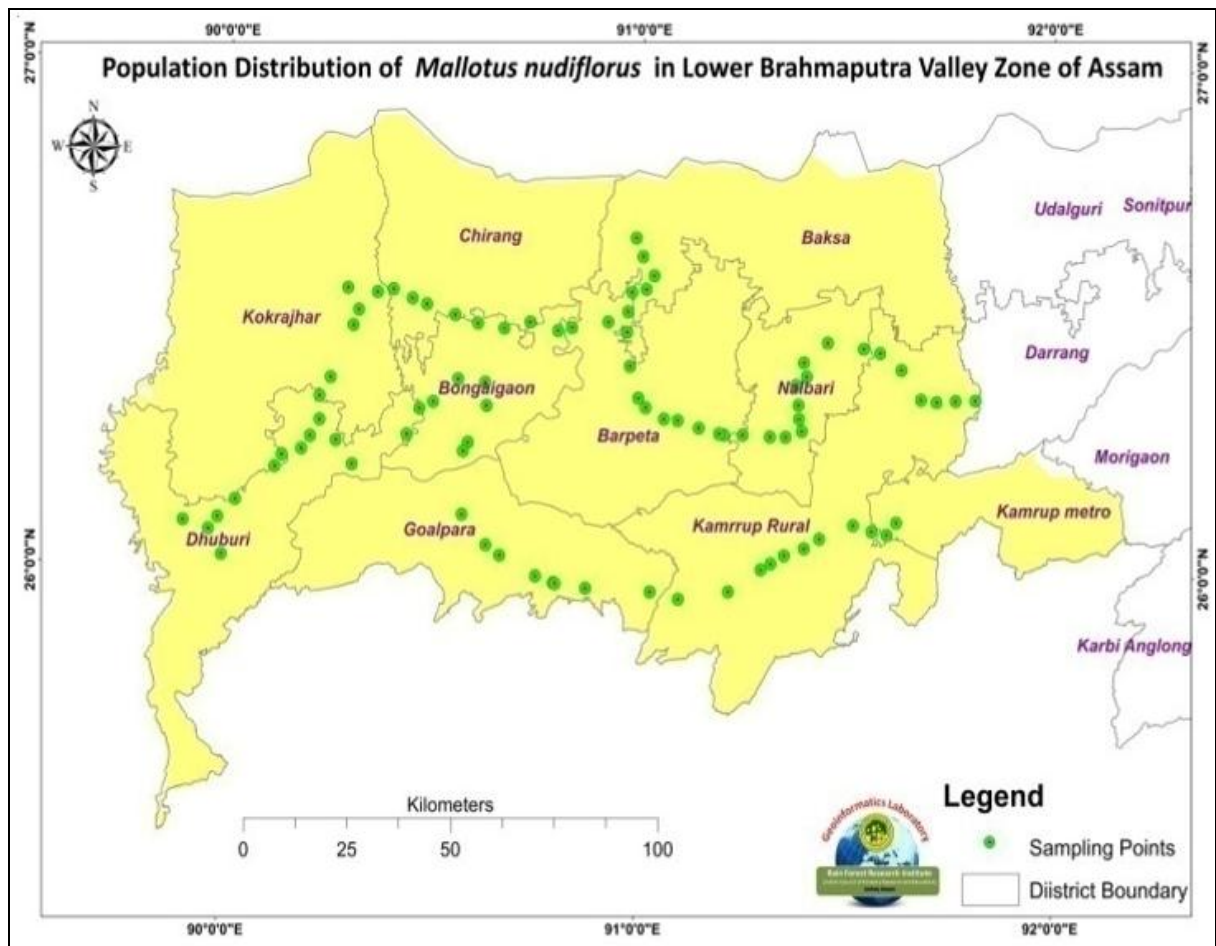
**Fig 1:** *Mallotus nudiflorus* A-Part view of population B-Tree, C- Male flowers, D- Fruits E- Seed F- Processing of fruits for fatty oil extraction

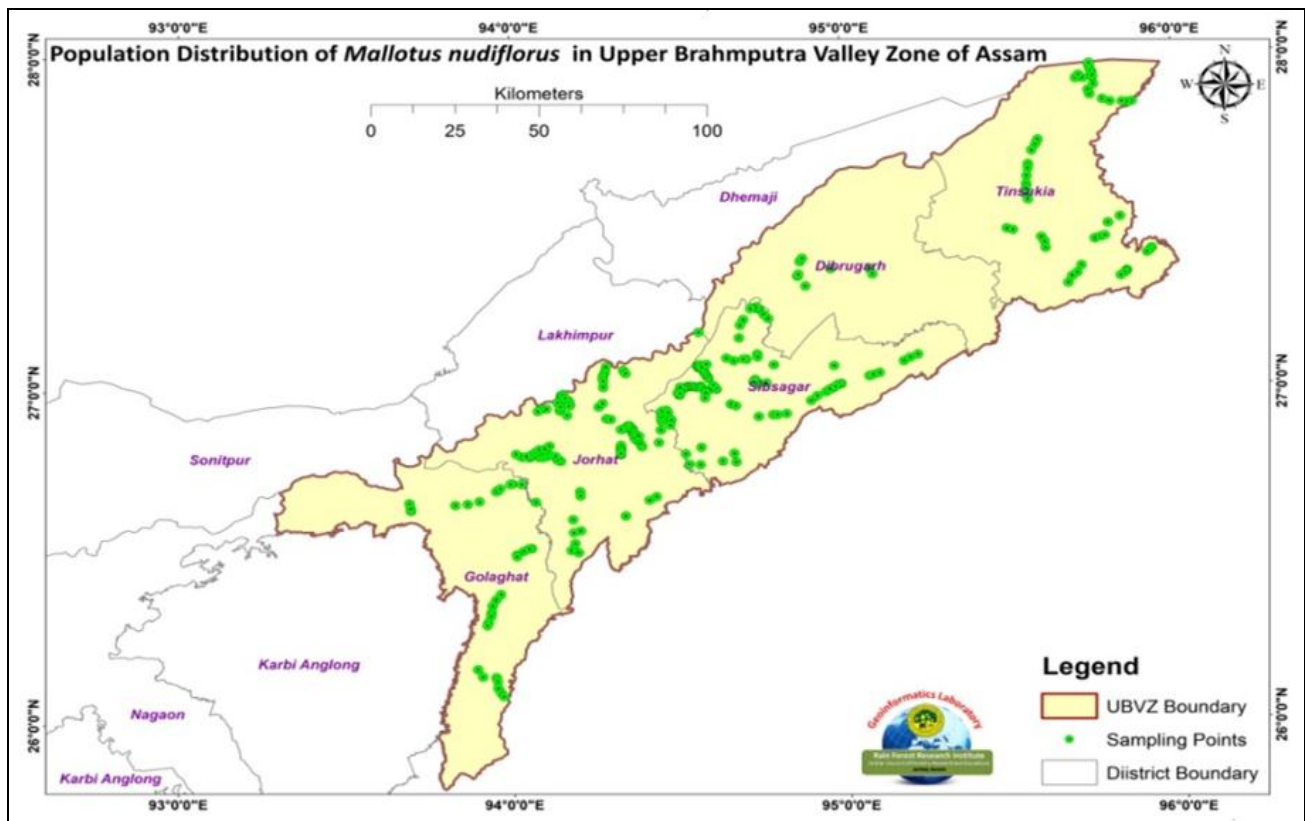
### Result and Discussion

Population distribution map for Upper Brahmaputra valley Zone, Hill Zone, North Bank Zone, Central Brahmaputra Valley Zone and Lower Brahmaputra Valley Zone were prepared for authentication of extent of distribution (Figure-2). The species was highly dispersed along with the water bodies in the Barhmaputra river basin. Population distribution of the species was sparse in two districts Karbi Anglong and Dima Hasao of Hill Zone. Study on physical characteristics of oil found that the colour of the oil was pale yellow or creamy yellow with sticky in nature. There was no any distinguished smell. The populations of *M. nudiflorus* showed lots of variations in total oil content ranging from  $1.51\pm 0.52$  to

$25.12\pm 0.17\%$  on the basis of dry weight. The highest percentage of fatty oil was found in Bilasipara population ( $25.12\pm 0.17\%$ ) followed by Boko population ( $23.33\pm 0.32\%$ ) of Lower Brahmaputra Valley Zone and Biswanath Chariali of ( $18.46\pm 0.64\%$ ) Central Brahmaputra Valley Zone. Findings suggested that fatty oil extracted from seeds from Bilasipara population have potential for its commercial production and cultivation. The lowest percentage of oil was found in Kolajan of North Bank Zone ( $1.51\pm 0.52\%$ ) (Table-1). Previously Khaleque *et al.* (2012)<sup>[6]</sup> also studied lipid classes and fatty acid compositions of seed oil grown under the soil and climatic condition of Bangladesh and found 22% oil, which is considered a cheap raw material in







**Fig 2:** Population map of *Mallotus nudiflorus* distributed in five Agro climatic zone of Assam

surface coating industry. Rahman *et al.* (2007) [7] stated that physico-chemical properties of the oil are directly related to their lipids classes. Heavier Oil Weight ( $15.55 \pm 0.81$ g) was recorded in the Kuthori population followed by Biswanath Chariali population ( $14.84 \pm 0.71$ g). However, moisture

content of the seed was found high in Diphu population ( $19.44 \pm 0.24$ ). Diversity in specific climato-ecological characteristics of agro climatic zones influenced the variation in oil content of studied populations.

**Table-1:** Estimation of Fatty oil content from seeds of *Mallotus nudiflorus* from different Agro climatic zones of Assam

Population sites	Moisture %	Oil Weight(g)	Yield % of oil	Agro climatic zone
Kolajan	$7.74 \pm 0.71$	$1.25 \pm 0.18$	$1.51 \pm 0.52$	North Bank Plain Zone
Dhemaji	$9.83 \pm 0.62$	$7.32 \pm 0.47$	$9.02 \pm 0.73$	
Biswanath Chariali	$5.97 \pm 0.53$	$14.84 \pm 0.71$	$17.54 \pm 0.82$	
Sonitpur	$12.01 \pm 0.74$	$9.48 \pm 0.87$	$11.97 \pm 0.69$	Central BVZ
Kohora	$10.25 \pm 0.61$	$7.18 \pm 0.63$	$8.89 \pm 0.78$	
Kuthori	$6.38 \pm 0.51$	$15.55 \pm 0.81$	$18.46 \pm 0.64$	Hill Zone
Hojai	$9.47 \pm 0.43$	$11.05 \pm 0.19$	$13.56 \pm 0.67$	
Donkamukan	$16.63 \pm 0.26$	$8.65 \pm 0.57$	$11.53 \pm 0.23$	
Diphu	$19.44 \pm 0.24$	$2.08 \pm 0.73$	$2.87 \pm 0.89$	Upper BVZ
Silonijan	$14.69 \pm 0.31$	$9.6 \pm 0.81$	$12.50 \pm 0.49$	
Sodiya	$13.60 \pm 0.57$	$9.59 \pm 0.73$	$12.05 \pm 0.63$	
Kolbari	$7.12 \pm 0.81$	$10.36 \pm 0.63$	$13.54 \pm 0.33$	Lower BVZ
Panidihing	$13.2 \pm 0.27$	$10.21 \pm 0.61$	$13.1 \pm 0.19$	
Jangimukh	$18.1 \pm 0.34$	$12.96 \pm 0.71$	$14.71 \pm 0.77$	
Bilasipara	$7.23 \pm 0.47$	$11.65 \pm 0.37$	$25.12 \pm 0.17$	
Boko	$6.41 \pm 0.57$	$10.92 \pm 0.49$	$23.33 \pm 0.32$	
Rangia	$7.68 \pm 0.61$	$6.62 \pm 0.64$	$14.29 \pm 0.25$	
Barpeta	$13.54 \pm 0.36$	$5.40 \pm 0.43$	$12.48 \pm 0.54$	
Dhupdhara	$8.21 \pm 0.68$	$7.12 \pm 0.61$	$15.52 \pm 0.69$	
Nalbari	$8.93 \pm 0.59$	$4.94 \pm 0.33$	$10.85 \pm 0.41$	

## Conclusion

The present showcased a great opportunity intended for selection of superior population in favour of obtaining high fatty oil yield from the seeds of *M. nudiflorus*. The superior population of Lower Brahmaputra Valley Zone may be introduced for large-scale plantation in support of commercial extraction of fatty oil in surface-coating industry on a

sustainable basis.

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