

# STUDY ON BRYOPHYTES AT RANGJULI AREA



SUBMITTED TO THE DEPARTMENT OF BOTANY, BIKALI  
COLLEGE FOR THE PARTIAL FULFILLMENT OF BACHELOR  
OF SCIENCE IN BOTANY

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**Paper** :- Project Work/ Dissertation  
**Paper Code** :- BOT-HE-6036

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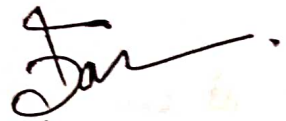
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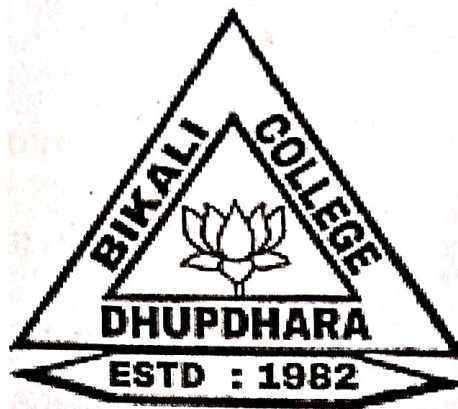
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STUDY ON TIMBER YIELDING PLANT AT LIVESTOCK  
RESEARCH STATION, ASSAM AGRICULTURAL  
UNIVERSITY HEKRA – MANDIRA



SUBMITTED TO THE DEPT. OF BOTANY,  
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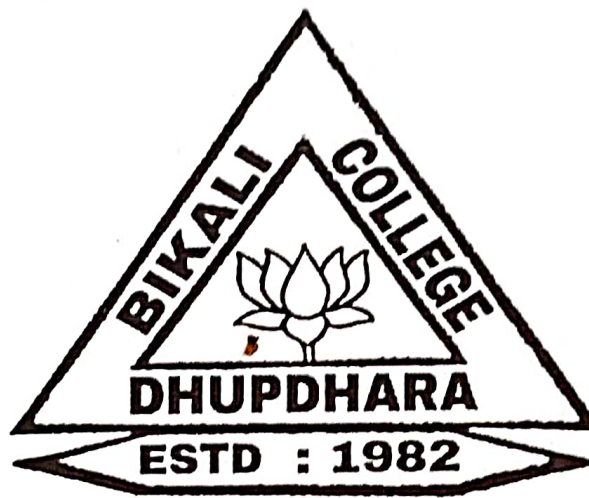
  
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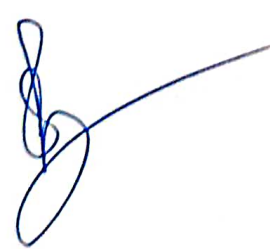


# Dissertation

ON  
Tea Gardening

Submitted to the Department of Botany,  
Bikali College Dhupdhara



*Examined*  


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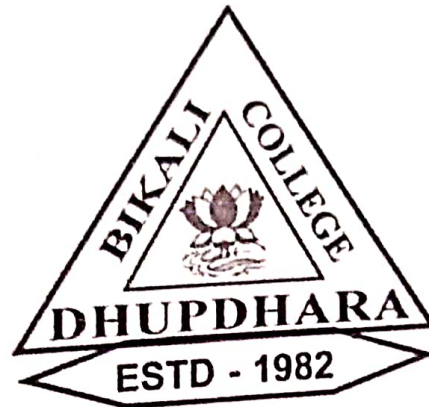
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Paper :- Dissertation

Paper Code : BOT-HE-6036

Bikali College, Dhupdhara

# A Project Report on Medicinal Plants of Assam



*Examin*  
Submitted to the Department of Botany, Bikali college Dhupdhara  
B.SC 6TH SEMESTER  
BOT- HE- 6036

Supported by

Prof. Sushmita Deka (HOD)

Department of Botany

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Session: 2022-23

## DECLARATION

I hereby declare that the project work of this dissertation entitled "MEDICINAL PLANTS OF ASSAM" has been originally carried out by me in the department of Botany, Bikali College, Dhupdhara.

Date: 26<sup>th</sup> June.

Place: Dhupdhara

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# Dissertation

ON  
Tea Gardening

Submitted to the Department of Botany,  
Bikali College Dhupdhara



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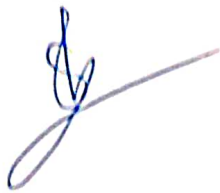
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## DISSERTATION ON MUSHROOM CULTIVATION



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**Dissertation on  
Rice Cultivation**



**Submitted to the Department of Botany ,Bikali College  
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# STUDY ON BRYOPHYTE AT MANDIRA , VILLAGE



SUBMITTED TO THE DEPARTMENT OF BOTANY , BIKALI COLLEGE FOR  
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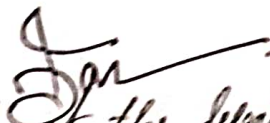
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**Dissertation on  
Rice Cultivation**



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A handwritten signature in black ink, which appears to read 'Bijumani Rabha', is written over a horizontal line.

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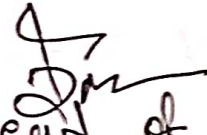
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# DISSERTATION ON CHILLI'S OF NORTHEAST INDIA



SUBMITTED TO THE DEPARTMENT OF BOTANY, BIKALI COLLEGE  
FOR THE PARTIAL FULFILLMENT OF BACHELOR OF SCIENCE IN  
BOTANY

*Examined*

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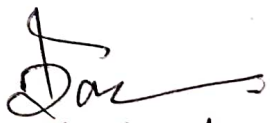
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This record has been made up to cover up the Botany paper 'BOT-HE-6036' as given for B.Sc 6<sup>th</sup> Semester by Guwahati university.

I sincerely thank my Botany Department teachers Prof. Jyotirmoy Das, Prof. Susmita Deka and Prof. Amrita Tulsiany.

The study has indeed helped me to explore more knowledge related to my topic.

Pshuna devi Rabha

B.Sc 6<sup>th</sup> Semester

## PREFACE

It is a great opportunity for me to have the Bachelor of Science (B.Sc) in Bikali college, Dhupdhara. In the accomplishment of this degree I am submitting a Dissertation on "CHILLI'S OF NORTHEAST INDIA"

Subject to the limitation of time, efforts and resources every possible attempt has been made to study the topic.



# SITE

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# INTRODUCTION

Chilli's are varieties of the berry-fruit of plants from the genus Capicum, which are members of the nightshade family Solanaceae, cultivated for their pungency. Chili peppers are widely used in many cuisines as a spice to add "heat" to dishes.

For India's Northeasterners, a meal without chilli is incomplete. In this hotspot region of rich biodiversity, varieties of chilli's are grown. The capicum, or chilli, species that exist here count among the world's fiercest.

Chilli peppers form an indispensable part of the list of ingredients for most of Northeast India. From simple green



Chutneys to roasted bhut jolokia flakes, all these peppers have a part to play in traditional cuisines. The fearsome Bhut Jolokia leads the crowd with the hotness of over 1 million Scoville Heat Units.

Scoville Heat Unit or SHU is the standard unit of measurement of a chilli's hotness that comes out of the pod's capsaicin content. Capsaicin is the ingredient that determines a chilli's ferocity and Northeast chillies are never low on that.

# SCIENTIFIC CLASSIFICATION

Kingdom : Plantae

Order : Solanales

Family : Solanaceae

Tribe : Capsiceae L.

Genus : Capsicum L.

# ORIGINS

Capsicum plants originated in modern-day Bolivia and have been a part of human diets since about 7,500 BC. They are one of the oldest cultivated crops in America.

Origins of cultivating chilli peppers have been traced to east-central Mexico some 6,000 years ago, although, according to research by the New York Botanical Garden press in 2014, chili plants were first cultivated independently across different locations in America including highland Bolivia, central Mexico, and the Amazon. They were one of the first self-pollinated crops cultivated in Mexico, Central America, and parts of South America.

## DISTRIBUTION TO ASIA

Chili peppers spread to Asia through their introduction by Portuguese traders, who aware of their trade value and resemblance to the spiciness of black pepper - promoted their commerce in the Asian spice trade routes. They were introduced in India by the Portuguese towards the end of the 16<sup>th</sup> Century. In 21<sup>st</sup> century Asian cuisine, chili peppers are commonly used across many regions.



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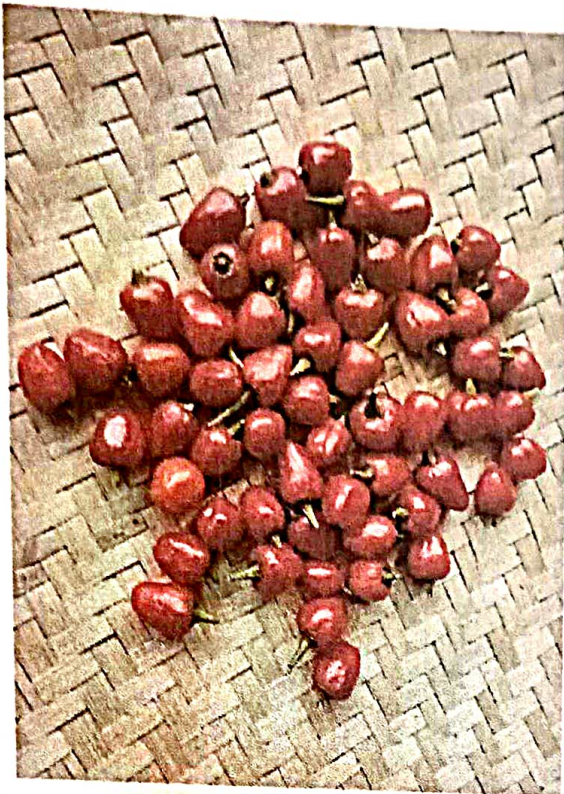
# CHILLI'S OF NORTHEAST INDIA

Top chillies of Northeast India, all of them are insanely hot.

1. Dalle Khursani
2. Bhut Jolokia
3. Naga King chilli
4. Hmancha te - Mizo chilli
5. Sohmynten Khnai - Meghalaya's Bird's Eye chilli.
6. Hathei Chilli
7. Krishna Jolokia
8. Sohmynten Bhut or keb or 'ken Rakot.
9. Sohmynten Kba.
10. Sohmynten Ding.
11. Sohmynten Thnat Syian



## 1. DALLE KHURSANI :



This round cherry pepper is Sikkim's signature chilli - a round ball of sweet fire that's synonymous with the state itself. Dalles are beautiful

to look at, especially when they're ripe, red colour. They deliver a fiery punch but taste as good too, with an unmistakable hint of sweet and fruity notes.

The dalle's heat measures between 100,000 and 3,50,000 SHU - which isn't mild by my standards. Consuming it will leave sweating away but the



lovable thing about it is that the thing doesn't linger on the mouth for long time.

The Dalle Khursani chillies are round in shape, green when unripe, gradually turning to yellow and bright red as they age. The downside is that they are very addictive. Once you acquire a taste for them there's no way you'd want to avoid wolfing down dalle in any form with every meal or snack.

They pair with almost any dish and options are open for you to chomp a raw cherry or two on the side with humble steamed rice, pulses, and vegetables. Or, spice up a meat dish to a hot and sweet high. Oh, you can grind the delectable dalles into sauce to dip flavourful dumplings in.



## 2. BHUT JOLOKIA



This Ghost Chilli of Assam needs no introduction. The Guinness Book of Records named it the hottest chilli in the world in 2007 but now it's relegated to sixth place.

The Bhut Jolokia scores between 1 to 1.6 million SHU. That's burning hot, so hot that a tiny morsel is sufficient to have with the meal more than that might burn the innards. Despite that, many people of Northeast, especially those of

Assam, Nagaland, Manipur, and Meghalaya love to take one or more of these on the side along with their meals.

This chilli is called by different names in other northeastern states such as Naga Mirchi, U Monok, Sohmynten Beb, and others. Earlier it was classed as belonging to the species Capsicum chinense Jacquin but recently it's said to be a distinct species, Capsicum assamicum, based on some morphological characteristics.

But scientists say it's still the world's spiciest naturally grown chilli. That means it is not artificially cross-pollinated with other specimens to create hybrids with increased ferocity. All the other chillies anywhere in the world that have beaten Bhut Jolokia in hotness are hybrid varieties that were created for that purpose.



The Bhut is highly perishable because of its intense heat. So, the best way to enjoy it beyond its fruiting seasons is to make pickles. It also has a sweet and fruity flavour that subtly complements its hotness.

But its best to take precautions while handling so that it doesn't enter the eyes or face.

Otherwise, with a Scoville rating of 1 to 1.6 SHU, any accidental rub would mean a visit to burning hell for the affected person.

Culinary speciality apart, the Bhut Jolekia is also valued for its health benefits - for example, its analgesic, anti-diabetic, and anti-obesity properties.

### 3. NAGA KING CHILLI :



You can't ignore this fiery cousin of the Bhut Jolokia and the two share closely similar features. Naga King chilli is placed in a taxonomic position between Capsicum chinense and Capsicum frutescens.

The Naga King chilli has a capsaicin content so big (2.06%, and Scoville rating of 855,000 to 2,200,000 SHU) that it ranks number six among the most



Pungent chillies of the world. That makes it unique which prompted the Nagaland government to obtain the Geographical Indication rights to it in 2006, although it grows in other north eastern states as well.

Its pungency is more than enough to scare away elephants from paddy fields but that's accompanied with a delightfully sweetish taste. And because of its high heat, it's also highly perishable. So if you want to eat it fresh, do so not later than 2-3 days after harvest. Else, dry it, powder it, or, better still, pickle it. Naga King Pickles are unforgettably heavenly.

There's one unique features in the Naga King chillis cultivation. It's the traditional and natural 'jhum', or slash and burn, method on forest land without the use of artificial fertilizers.

#### 4. HMARCHA TE - MIZO CHILLI :

Bird's eye chilli (*Capsicum frutescens*) has come a long way from the Amazon Basin and the Mexican city of Tabasco to the Lushai Hills of Mizoram. It's prevalent all over the Northeast but Mizoram has gone one up in obtaining the Geographical Indication tag for their prized 'hmarcha te' or 'vaihmarcha' or 'Mizoram bird's eye chilli.'

Midget among chillies, the fiery hot Hmarchate is a favourite not only among the Mizos but among all Northeast people. It's also in high demand in neighbouring countries such as Myanmar and others of Southeast Asia.

It makes spicy sauces, pickles and chutneys and is also used as medicine by the locals for many ailments such as these



of the gut and pain relief.

But how is the Mizo chilli different from others of its kind? The reason lies in Mizoram's diversified soil and climatic conditions. Mizoram has pleasant weather throughout, and the soils are sandy to loamy to clayey and acidic, rich in humus, with medium phosphorus and potash content.

And here's the most unique feature: Like the Naga King, Mizo chilli is also grown using completely natural methods on 'ghum land' without artificial fertilizers. The burning of the dead plant matter itself creates high ash content which results in the distinctive red colour of the chillies.

You can find the hmarchate growing everywhere in Mizoram, from the low-lying western regions of Chawgte to the Blue Mountains of the Southeast.

Mizo chilli has three grades. Grade A is only about one centimetre in length - smallest, thinnest, but the most pungent, and the most in-demand. Next is Grade B, slightly thicker and longer. Grade C is similar to Grade B in thickness but a bit longer. The chillies change colour from green to yellow to red in various stages of ripening.

The Mizos love their boiled food with the alkali-infused mizo bai. And their favourite Bird's eye chilli adds the desired punch and taste. To top that, they also dish out chutney of hmarchate, onion, garlic and ginger. That's something you'll also savour and crave for once you can stomach the bird's eye's heat of 50,000 to 100,000 SHU. Otherwise, the quick and best way to enjoy mizo chilli is the pickled way. Even a wee chilli with a few drops of the oil will do the trick to lift the taste of your meal to the next level.



## 5. SOHMYNKEN KHNAI - MEGHALAYA'S

### BIRD'S EYE CHILLI

Meghalaya's Sohmynken Khnai or bird's eye chilli isn't different in looks from bird's eye chillies of other northeastern states except perhaps in pungency levels.

Sohmynken Khnai are of two types: Sohmynken Khnai kit (small) and Sohmynken Khnai hek (big). The small ones are no longer than 1 cm and the big ones, 2 cm but both heat up between 100,000 and 225,000 SHU which is quite punishing.

Farmers say birds love to eat the bright red ripe chillies and play a crucial role in propagating the plant. Because the seeds stay undigested inside their warm bodies, their coats soften up. That later helps them germinate faster after the birds drop them along with their excreta.

Bah Ha, a farmer from Ri Choi district who also cultivates chillies says chilli plants love shades and grows beautifully under plantain trees and on soils fertilised by fallen bamboo leaves.

As a food, the Khasis love to eat sohmynten khnai by themselves as well as by pickling in oil together with bamboo shoots.

As a medicine, these chillies help in problems such as diarrhoea and dysentery, bringing down fevers, and strengthening the heart.



## 6. HATHEI CHILLI :



Sixty-six kilometres west of Manipur's capital city, Imphal, in Ukhrul district, lies the bustling village of Sinarakhong. The village is now famous for the Northeast's only chilli festival, the Hathei Phanit Festival, held every year since 2009 to showcase Ukhrul's rich wealth of chillies of various kinds and species. But one chilli remains the star of the show, year after year, and that's the Hathei or the Sinarakhong chilli. It's a vibrant red colour and distinct taste



makes it one of the most sought-after chillies of Manipur. It's not surprising that Hathei chillies provide farmers with a major chunk of income but the demand is so much that farmers struggle to match it with the supply.

According to legend, Hathei chillies were discovered by the village elders long ago, while they were hunting in the forests. They found unusually long chilli fruits of about 6 to 8 inches with a bright red colour. That indicates high carotene content.

Many have tried planting it elsewhere but the chilli plant doesn't exhibit the same characteristics it does in Sirarakhong. That's why the Sirarakhong villagers call the Sirarakhong villagers call Hathei chillies God's gift to them and the pride of the Tangkhuls.

This unique chilli is also beneficial for health. It's an excellent diuretic and brings shine to hair.

The Government of Manipur has also obtained the Geographical Indication tag for Hathei chilli.



## 7. KRISHNA JOLOKIA



Not everyone can stomach the punishing pungency of Bhut Jolokia, Naga King chilli, Dalle Khursane, or Bird's Eye chilli. For folks such as these, the Krishna Jolokia of Assam is the finest option.

Krishna Jolokia grows well in most places of the Northeast, especially in the homestead gardens of Assam. Their fruits are near black while still not fully ripe but



once they ripen, they turn a bright red.

What endears it to the faint of heart is its near sweet flavour and medium-level 40,000 to 80,000 Scoville heat levels. That lets them enjoy chillies daily without the fear of a continuous burning sensation afterwards.

## 8. SOHMYNKEN BHOT OR BEB OR 'KEN RAKOT'

Meghalaya's Sohmynken Beb or Bhot is also of similar texture and characteristics to the Bhut Jolokia of Assam, the Naga King chilli of Nagaland, and the U Morok of Manipur - its equally fiery and fearsome.

Chilli farmers of Ri-Bhei district cultivate 'u Ken keb' in large numbers on raised beds or 'buns' gently sloping grounds to ensure the fields don't get inundated.

Because they love the shade, other plants such as ginger or tapioca are planted along to provide a kind of canopy.

Being high on capsaicin (the compound that gives a chilli its spiciness) it is also highly perishable. So it's best consumed fresh



within three or four days after harvest.

Else, the next best thing is to dry and pound to flakes or powder. That will increase shelf life for months if stored properly.

Those who dare eat it raw but the 'Ken beb' makes especially blistering pickles that carry an inimitable sweetish tinge.

And, of course, if you want to enjoy it year-round pickling is the most flavourful way to preserve 'Ken beb'.

Pickling in oil lets addition of aromatic spices of own choice such as fenugreek, caraway, black cumin, and fennel that'll surely take the taste and flavour to an altogether new level.



But be cautioned. When you eat 'Ken keb, raw or pickled, make sure you start with just a tiny morsel. You might find that wee piece itself is potent enough to burn the roof of your mouth down. And a tiny drop of the oil will add so much fragrance to your meal it'll make you sleep, both in pain - from the burning, and in pleasure from the fragrance.

## 9. SOHMYNKEN KBA

Like tiny bullets, 'Ken Kba' are small, slender, and stinging chillies that are found in Meghalaya. About 3 to 4 cm in length, they aren't as tiny as 'Ken Khnai' nor as spicy but they're popular as raw complements to a meal or to make pickles and chutneys.

Kba means paddy and one would think they got the name because farmers intercrop them with rice plants. But that's not the case. They got that name because their seeds are often found mixed with threshed paddy. One explanation for this must be that birds dropped them on the rice grains as they dry in the sun.

'Ken Kba' also loves shaded areas under partial canopies of taller plants such as yam and bananas. There they have

enough nutrients and the soil is moist but not wet.

Unlike the other two chillies, you can enjoy 'Ken Kba without the fears of an after-burning. Their pickles are as pleasant too and would burn a hole through the roof of your mouth.



## 10. SOHMYNKEN DING:

In Khasi, 'ding' means 'fire' and 'ken ding' is a fiery as its name. It's similar to Dalle Khursani of Sikkim, round but a little flat at the tip. Take a bite and a piercing hot sensation with hints of sweet fruit greets your taste buds.

You'll kind of love 'ken din' which is found in Meghalaya. Its flesh has body in it, which feels nice to sink your teeth into, unlike the 'thin-skinned' 'Ken Khnai' or the small 'Ken Kba'.

Sohmynken Ding isn't as high on the popularity rate as the others but its getting noticed for its juicier flesh and fuller body.

In great demand for making dynamite  
chutneys to accompany dumplings, they're  
as great for pickles to enjoy year round.

## 11. SOHMYNKEN THNAT SYIAR:

Thick and long - about 8 cm this is one chilli from Meghalaya that rarely features raw on the table.

It is however, particularly great as a stuffed pickle (ashar). And the mix of green, yellow and red thnat syiar chillies make quite an eye-catching, colourful display on the transparent glass jar.

To make 'ashar' 'ken thnat syiar', what the locals do is first wash and pat dry the chillies, slit them in the middle, mix turmeric and salt, and leave them on a 'pdung' (bamboo tray) in the high sun for a few days to dry.

Meanwhile a pickle masala mix stuffing usually of roasted and pounded fenugreek, fennel and cumin seeds as the



main ingredients - gets ready. Thus stuffed, the chillies then go into large glass jars and are topped with a generous quantity of mustard oil.

The bottles stand in the hot sun from a few weeks to two months, occasionally turned or stirred. After that, 'Ken thnat-syiam' pickles are ready.

'Ken thnat syiam's' big size makes ideal hot and aromatic 'ktung nei-iong' curry.

First, a thick gravy of onion, ginger, garlic and the favourite festive spice, the earthy-flavoured aromatic neieng (black sesame seeds) is set to boil.

Then in goes a handful of dry fish such as 'tung puia khlein', or 'tungkha', and, of course, a good number of 'Ken thnat syiam'.

The number depends on how spicy you want it. The gravy goes on simmer for good fifteen or so minutes and then is served hot with steamed rice and vegetables.

That's one hot, pungent, aromatic meal you'll want to eat time and again.







## TOPICAL USE AND HEALTH RESEARCH :

Capaicin, the pungent chemical in chili peppers, is used as an analgesic in topical ointments, nasal sprays, and dermal patches to relieve pain. A 2022 review of preliminary research indicated that regular consumption of chili peppers was associated with weak evidence for a lower risk of death from cardiovascular diseases and cancer.

## CHEMICAL IRRITANTS

Capaicin extracted from chilies is used in pepper sprays and some tear gas formulations as a chemical irritant, for use as low-lethal weapons for control of unruly individuals or crowds. Such products have considerable potential for misuse, and may cause injury or death.

## CROP DEFENSE :

Conflicts between farmers and elephants have long been widespread in African and Asian countries, where elephants nightly destroy crops, raid grain houses, and sometimes kill people. Farmers have found the use of chillies effective in crop defense against elephants. Elephants do not like capsaicin. Because the elephants have a large and sensitive olfactory and nasal system, the smell of the chili causes them discomfort and deters them from feeding on the crops. By planting a few rows of the fruit around valuable crops, farmers create a buffer zone through which the elephants are reluctant to pass. Chili dung bombs are also used for this purpose. They are bricks made of mixing dung and chili, and are burned, creating a noxious smoke that keeps hungry elephants out of farmers' fields. This can lessen dangerous physical confrontation between people and elephants.



## FOOD DEFENSE :

Birds do not have the same sensitivity to capsaicin, because it targets a specific pain receptor in mammals. Chilli peppers are eaten by birds living in the 'chilli peppers' natural range, possibly contributing to seed dispersal and evolution of the protective capsaicin in chilli peppers, as a bird in flight can spread the seeds further away from the parent plant after they pass through its digestive system than any land or tree dwelling mammal could do so under the same circumstances, thus reducing competition for resources..



## NUTRITIONAL VALUE :

Peppers, hot chili, red, raw

Nutritional value per 100g (3.5 oz)

Energy : 166 KJ (40 Kcal)

Carbohydrates : 8.8g

Sugars : 5.3g

Dietary fiber : 1.5g

Fat : 0.4g

Protein : 1.9g

<u>vitamins</u>	<u>Quantity</u>
vitamin A equiv. beta-Carotene	48 µg
vitamin B <sub>6</sub>	0.51 mg
vitamin C	144 mg

<u>Minerals</u>	<u>Quantity</u>
Iron	1 mg
magnesium	23 mg
potassium	322 mg

<u>Other constituents</u>	<u>Quantity</u>
Water	88 g
capsaicin	0.01 g - 6 g

## CONCLUSION

After going deep into the topic, I have come to know various information that I was unfamiliar with. I have come to know various species of chillies grown in Northeast region of India as well as their characteristics, uses, and so on.

The dissertation work has provided me with knowledge and I am really grateful for it.