INTRODUCTION
Modern drug development from the cradle of medicinal plants is the emerging trend around the globe. Herbal medicines are in a forefront of health-care tool in several countries. A report of the World Health Organization revealed that 80% of the world populations [1] in developing countries depend primarily on herbal medicines.

Terminalia bellirica is such a medicinal plant which has extensive usage as pharmaceutical and nutraceuticals. T. bellirica is found in deciduous forest throughout in India below the elevations of about 3000 ft, except in the dry and arid regions of Snd and Rajputana. It grows in upper Gangetic plains, Chota Nagpur, Bihar Orissa, West Bengal, Konkan, Deccan, and in most of South India [2]. Baheda is a tall (12–50 m) tree, with characteristic bark. Leaves are petiolate, entire, approximately 8–20 cm long, 7.5–15 cm wide, 2.15 cm long with petiole; alternately arranged or fascicled at the end of branches, elliptic or elliptic-obovate, surface leathery, dotted with narrow-pointed or rounded leaf-tip. Flowers arise in spikes from leaf axils, 5–15 cm long, greenish-yellow sessile, each 5–6 mm across; each spike possesses male flowers toward upper portion and bisexual flowers toward the lower portion. Stamens are 3–4 mm long. Fruit is obovoid, 1.5–2.5 cm in diameter, dark brown, hard, covered with minute pale pubescence; seed stony, edible, light brown, indistinctly 5 angled [3].

Plant drug collection and authentication
The matured fruits of T. bellirica were collected from local market of Kolkata, West Bengal, in the month of December 2018 and authenticated in the Department of Pharmacognosy, Central Ayurveda Research Institute for Drug Development, Kolkata, and deposited in the department, available for future reference.

Plant samples processing and storage
An amount of 100 g authenticated fruits was crushed to obtain coarse powder kept in an airtight glass jar, and labeled as F (indicating whole fruit).

MATERIALS AND METHODS
Materials and reagents
The work has been carried out using the chemicals, reagents, and solvents of Emplura grade of Merck and aluminum supported thin-layer chromatography (TLC) plates were purchased from E. Merck Pvt. Ltd. (Mumbai, India).

Plant drug collection and authentication
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Plant samples processing and storage
An amount of 100 g authenticated fruits was crushed to obtain coarse powder kept in an airtight glass jar, and labeled as F (indicating whole fruit).
Approximately 400 g of fruit were broken to obtain epicarp, mesocarp (a thin papery endocarp is adhered with), and seeds. These fruit parts were sorted by handpicked and crushed separately. Segregated fruit parts were kept in three different glass jars, labeled as E (indicating epicarp), M (indicating mesocarp), and S (indicating seeds). Hence, four samples, namely, F, E, M, and S were obtained.

Preparation of plant extract
In this study, design different quantitative and qualitative estimation was done with the plant extracts. Hence, it was the requirement to extract the plant sample in different solvents. Therefore, the plant materials were subjected to extraction for 1 h in Soxhlet apparatus, separately with petroleum ether, chloroform, ethyl acetate, acetone, methanol, ethanol, water, and equivalent aqueous ethanol. In each case, 5 g of the plant material was extracted with 150 ml solvent by maintaining the standard condition of extraction method as mentioned in standard [7] guidelines. Extracts were filtered and by keeping the standard condition of extraction method as almost of negligible quantity in seeds attributed by the biochemical assays.

Physicochemical assay
Total phenolic content was determined using Folin-Ciocalteu reagent [10] with spectrophotometry at absorption maxima 760 nm. Gallic acid was used as standard and the phenolic content was expressed as gallic acid equivalent (GAE) in mg/gm of dry weight. Total flavonoid content was measured using ferric chloride reagent [11] and observing absorbance at 415 nm. Estimated quantity of flavonoids was expressed as quercetin equivalents (QE) in mg/gm of dry weight. Total tannins were determined by gravimetric method [8] using hide powder. Coarse powder materials were subjected to steam distillation [8] for determining the volatile oil content of the samples using Clevenger apparatus.

HPTLC
The extract (2 µL) was applied in the form of 8 mm band, 15 mm from the bottom of a 10 x 10 cm precoated aluminum supported precoated silica gel 60 F<sub>254</sub> plate, with the help of ATS-4 applicator attached to a CAMAG HPTLC system. The plate was developed in a pre-saturated twin trough chamber using the mobile phase as hexane:ethyl acetate:ethyl formate:formic acid (7:2:0.5:0.5, v/v) to a distance of 8 cm, dried for 5 min in ambient air. Images of the developed plate were captured under 254 nm and 366 nm ultraviolet (UV) light [12].

RESULTS AND DISCUSSION
Organoleptic characters
Organoleptic characters of the seed are different from rest of the fruit part. The distinguishing characters are noted in Table 1. Astringent odor indicates the high presence of tannins and phenolics, which are almost of negligible quantity in seeds attributed by the biochemical assays.

Organoleptic properties were concluded by individual experiences through the senses such as touch, taste, sight, and smell.

Organoleptic characters

| Organoleptic characters | F | E | M | S |
|------------------------|---|---|---|---|
| Color                  | Light brown | Light brown | Yellowish | Yellowish-brown |
| Odor                   | Characteristics smell | Characteristics smell | Characteristics smell | No significantsmell |
| Touch                  | Hard and rough | Rough | Hard | Surface uneven and less hard |
| Taste                  | Astringent | Astringent | Astringent | Nut-like taste |

Table 1: Organoleptic characters

Table 2: Physicochemical evaluations

| Parameters                  | F            | E            | M            | S            |
|-----------------------------|--------------|--------------|--------------|--------------|
| Loss on drying              | 12.27±0.01   | 13.32±0.02   | 7.68±0.01    | 6.5±0.01     |
| Total ash value             | 3.46±0.01    | 4.18±0.01    | 1.23±0.02    | 3.78±0.02    |
| Acid-insoluble ash          | 0.56±0.03    | 1.85±0.03    | 1.41±0.04    | 0.6±0.04     |
| Water-soluble ash           | 1.9±0.01     | 2.36±0.01    | 1.36±0.02    | 0.65±0.05    |
| Sulfated ash                | 0.8±0.01     | 0.93±0.01    | 0.25±0.01    | 0.81±0.02    |
| pH (10% aqueous suspension) | 4.66±0.01    | 4.56±0.02    | 4.55±0.02    | 5.72±0.02    |
| Alcohol-soluble extractive  | 15.20±0.02   | 20.73±0.17   | 4.56±0.19    | 12.50±0.18   |
| Water-soluble extractive    | 33.93±0.025  | 43.01±0.02   | 12.40±0.02   | 6.72±0.19    |
| Hydroalcoholic (1:1) extractive | 40.05±0.12 | 32.25±0.05   | 21.65±0.04   | 15.41±0.04   |

Table 3: Phytochemical screening

| Phytochemical class | Class | F | E | M | S |
|---------------------|-------|---|---|---|---|
| Alkaloid            | ++    | ++ | ++ | -- | -- |
| Flavonoid           | ++    | ++ | ++ | -- | -- |
| Glycoside           | ++    | ++ | ++ | √  | √  |
| Cardiac glycosides  | +     | +  | +  | ++ | ++ |
| Phenolic            | ++    | ++ | ++ | √  | √  |
| Steroid             | ++    | ++ | ++ | -- | -- |
| Terpenoid           | √     | √  | +  | ++ | ++ |
| Fatty ester         | +     | +  | +  | ++ | ++ |
| Free acid           | +     | +  | +  | ++ | ++ |
| Lignans             | ++    | ++ | ++ | -- | -- |
| Tannins             | ++    | ++ | ++ | √  | √  |
| Phlobatannins       | ++    | ++ | ++ | √  | √  |
| Carbohydrates       | ++    | ++ | ++ | √  | √  |

*Values are expressed as Means±S.D

**Indicates high presence, *indicates presence in moderate quantity,”indicates absence of constituents

The physicochemical constant such as ash values, loss on drying, extractable values, and pH value of the plant materials were determined using coarse powder [8]. Extractability was studied with different solvents such as ethanol and water and with equivalent aqueous ethanol. Extracts were performed by conventional cold and hot extraction method [8]. pH values of samples were checked using 10% aqueous suspension.

Physicochemical evaluation
The individual dried extracts of the plant drug obtained from hexane, chloroform, acetone, ethyl acetate, methanol, ethanol, and water were used for screening the presence of secondary metabolites using standard [9] reagents and methods.

Biochemical assay
Total phenolic content was determined using Folin-Ciocalteu reagent [10] with spectrophotometry at absorption maxima 760 nm. Gallic acid was used as standard and the phenolic content was expressed as gallic acid equivalent (GAE) in mg/gm of dry weight. Total flavonoid content was measured using ferric chloride reagent [11] and observing absorbance at 415 nm. Estimated quantity of flavonoids was expressed as quercetin equivalents (QE) in mg/gm of dry weight. Total tannins were determined by gravimetric method [8] using hide powder. Coarse powder materials were subjected to steam distillation [8] for determining the volatile oil content of the samples using Clevenger apparatus.

RESUL TS AND DISCUSSION
Organoleptic characters
Organoleptic characters of the seed are different from rest of the fruit part. The distinguishing characters are noted in Table 1. Astringent odor indicates the high presence of tannins and phenolics, which are almost of negligible quantity in seeds attributed by the biochemical assays.
Physicochemical evaluation

Least water-soluble extractive value of seed indicates the presence of lesser quantity of polar phytochemicals while epicarp is having highest phytochemicals of polar nature. Other physicochemical constants are noted in Table 2.

Phytochemical screening

Major observations in phytochemical presence are noted in Table 3; it shows that seed does not contain lignans and steroids while it bears an appreciable amount of essential oil which is almost negligible in other parts. The epicarp and mesocarp contain major secondary metabolites.

Biochemical assay

The results of proximate estimation are shown in Table 4. The seed is enriched with oils (13.25%) and a poor quantity of tannins (2.34 mg/g of dried plant material) is noted but almost void of phenolics (0.65 GAE) and flavonoids (0.77 QE). Data obtained from the biochemical assays are shown in Table 4 and a diagram depicting the comparative quantity is represented in Fig. 2.

HPTLC

The HPTLC experimental condition was optimized using pre-activated and pre-coated TLC silica gel 60 F<sub>254</sub> plates and different combinations of polar and non-polar solvents as the mobile phases (data not shown). The best result was obtained with hexane:ethyl acetate:ethyl formate:formic acid (7:2:0.5:0.5, v/v) as the mobile phase, which showed 9, 16, 14, and 2 bands for F, E, M, and S, respectively, when visualized under UV at 254 nm and at 366 nm, 10, 21, 20, and 4 bands for F, E, M, and S, respectively, was seen. The R<sub>f</sub> values of bands shown in different visualization are shown in Table 5. Pictorial representation of the bands at different visualization are given in Fig. 3a and b. The pictorial representation clearly indicates that the seed is having least quantity of phytochemicals.

CONCLUSION

The study concluded that seeds are less important in respect to the presence of secondary metabolites. The mesocarp and epicarp are holding the major responsibilities of therapeutic values imposed on the fruit.

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AUTHOR’S CONTRIBUTIONS

Being the single worker, author of the present study designed the study and performed all work related to this.

CONFLICTS OF INTEREST

The author declares that he has no conflicts of interest.

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