Read this first

This file is a **sample synopsis for study reference** for the IGNOU MSCBCH Project, course MBCP 001 (MBCP-001 Research Project, 8 credits, Semester IV of the M.Sc. (Biochemistry) programme). It shows how one practical enzymology topic can be laid out against the parts that the MBCP-001 Research Project Guidelines (School of Sciences, January 2026 print) ask for. It is **not for submission**, in full or in part, and it must not be presented as your own work.

It was prepared by the ignouproject.com editorial desk with AI assistance, from sections IV and V of the MBCP-001 guidelines, and every reference listed at the end was checked against its publisher or index record in November 2026. Words in [square brackets] are for your own facts: your varieties, your market, your laboratory, your supervisor and your dates. No results appear here, because results can only come from your own bench work.

Three things to settle with your supervisor before you copy this layout:

1. Length. The January 2026 print gives three figures for the synopsis: about 500 to 700 words in section IV, 14 to 18 pages in the enclosure list and 15 to 20 pages in section V. This sample is shorter than the page figures. Ask your supervisor or mscbch@ignou.ac.in which one the evaluator applies.

2. Parts. Section IV lists six parts and section V lists eight. This sample carries all of them, in the section V order, with the section IV items (hypothesis, implications for human life and environment, time schedule) placed where they fit.

3. Topic. The guidelines ask for a practical-oriented project, not a theory or literature-based exercise. Choose a topic your supervisor's laboratory can actually run; do not reuse this one if other learners at your study centre are already using it.

Packet reminder from the guidelines: proforma signed and dated by you and your supervisor, the supervisor's signed and dated bio-data with a certified copy of proof of identity, the synopsis, and a self-addressed stamped envelope, sent to The Programme Coordinator (MSCBCH), School of Sciences, Academic Complex, Block-D, IGNOU, Maidan Garhi, New Delhi 110068 (or as a soft copy to mscbch@ignou.ac.in), during 1 January to 15 March or 1 July to 15 September.

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PROJECT PROPOSAL (SYNOPSIS)

MBCP 001: Research Project

Master of Science (Biochemistry) (MSCBCH)

Polyphenol Oxidase Activity and Enzymatic Browning in [two to four] Brinjal (*Solanum melongena* L.) Varieties Sold in [your town or district]: Effect of pH, Temperature and Common Anti-browning Agents

Learner: [your full name]

Enrolment No.: [your enrolment number]

Study Centre: [code] Regional Centre: [name and code]

Proposed supervisor: [name, designation, institution]

Place of bench work: [laboratory, institution, city]

Submitted to the School of Sciences, IGNOU, [month and year]

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1. Title of the project

Polyphenol Oxidase Activity and Enzymatic Browning in [two to four] Brinjal (*Solanum melongena* L.) Varieties Sold in [your town or district]: Effect of pH, Temperature and Common Anti-browning Agents.

The title names the enzyme, the material, the place and the three variables, so the evaluator can see the scope in one line. Section 6 of the report guidelines asks that this title stays the same from the proforma to the bound report.

2. Introduction and objectives of the project

Brinjal turns brown within minutes of cutting. The reaction is catalysed by polyphenol oxidase (PPO), which oxidises phenolic compounds in the cut tissue and so starts enzymatic browning (Mishra, Gautam and Sharma, 2013). In households and in fresh-cut processing this browning lowers the look and the acceptability of the vegetable. Varieties differ in how quickly they brown, and the difference has been linked to both PPO activity and the amount of phenolic substrate in the tissue (Mishra, Gautam and Sharma, 2013; Plazas et al., 2013).

[Two to four] varieties are sold in [your town or district], and no study on their PPO activity was found in [the databases you searched, for example PubMed and Google Scholar, on your search date]. The project will measure PPO activity and browning in these varieties, study how pH and temperature change the activity of the crude enzyme, and test anti-browning agents that a household or a small processor can use.

Statement of the topic. The study measures and compares polyphenol oxidase activity, its kinetic constants and the browning of cut tissue in [two to four] locally sold brinjal varieties, and tests the effect of pH, temperature and four anti-browning agents on the crude enzyme.

Objectives (the guidelines advise four or five, achievable and measurable):

(i) To estimate PPO activity and protein content, and so the specific activity, in crude extracts of [two to four] brinjal varieties.
(ii) To determine the optimum pH and optimum temperature of crude PPO from each variety.
(iii) To determine the apparent Km and Vmax of crude PPO with catechol as substrate.
(iv) To compare the inhibition of PPO activity by ascorbic acid, citric acid, cysteine

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hydrochloride and potassium metabisulphite.

(v) To examine the relationship between PPO activity and the browning index of cut tissue.

Hypotheses (section IV allows them to be written as research questions):

H01: There is no significant difference in PPO specific activity among the varieties studied.

H02: The four agents do not differ significantly in their inhibition of PPO activity.

H03: There is no significant correlation between PPO activity and the browning index of cut tissue.

3. Review of literature

Mayer (2006) reviewed the structure, distribution, location and properties of plant and fungal polyphenol oxidases, together with newly discovered inhibitors, and noted that most plants and fungi carry multiple forms of PPO. This review gives the background for treating the brinjal enzyme as a mixture of forms in a crude extract.

Mishra, Gautam and Sharma (2012) purified one PPO isoform from eggplant 259-fold. It was a 112 kDa homodimer with a low Km (0.34 mM) for 4-methyl catechol. Cysteine hydrochloride, potassium metabisulphite and ascorbic acid inhibited the enzyme competitively, while citric acid showed mixed inhibition. The present study uses a crude extract and catechol, so its constants will be apparent values and are not expected to match those of the purified isoform.

Mishra, Gautam and Sharma (2013) compared eight eggplant cultivars and found that browning of fresh fruit depended on both phenolic content and PPO specific activity, while in stored fruit total phenolic content played the major role. Plazas et al. (2013) studied 18 eggplant accessions and reported differences of up to 3.36-fold in fruit flesh browning, with liquid extract browning correlated with chlorogenic acid content (r = 0.852). Both studies support comparing varieties rather than treating brinjal as one material.

[Add three to five recent studies you have read yourself, with the year, the material, the method and the finding of each. The guidelines read the review of literature together with findings and evaluation for 50 per cent of the report weight, and in the approval letters we see, the most common correction asks for the review to be brought up to date.]

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Gap. [State in one or two sentences what is not yet known for the varieties sold in your area, based on your own search.]

4. Methodology

Design. Laboratory experimental study. The guidelines ask for a practical project; every value in the report will come from assays run by the learner.

Material and sample size. Fruits of [variety names] bought from [market] on [dates]. [Number] fruits per variety, three independent extractions per variety (biological replicates), each assayed in triplicate (technical replicates). Fruits will be of similar size and maturity, recorded with date and source.

Tools and techniques. UV-visible spectrophotometer, refrigerated centrifuge, pH meter, water bath, analytical balance, and the reagents listed in Appendix [ ].

(a) *Crude enzyme extraction*: tissue homogenised in cold [sodium phosphate] buffer, [pH and molarity agreed with the supervisor], with insoluble polyvinylpolypyrrolidone, filtered and centrifuged; the supernatant is the crude enzyme.

(b) *PPO assay*: the increase in absorbance with catechol as substrate, read at a wavelength fixed after a spectral scan of the oxidised product [record the wavelength used]; one unit defined as [definition agreed with the supervisor].

(c) *Protein*: Bradford (1976) dye-binding method with a bovine serum albumin standard curve; specific activity = units per mg protein.

(d) *pH and temperature*: activity across [pH range] in suitable buffers, and across [temperature range] in a water bath.

(e) *Kinetics*: initial rates at [number] catechol concentrations; apparent Km and Vmax from the Lineweaver-Burk double reciprocal plot (Lineweaver and Burk, 1934), checked against a non-linear fit if software allows.

(f) *Anti-browning agents*: per cent inhibition by ascorbic acid, citric acid, cysteine hydrochloride and potassium metabisulphite at [concentrations].

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(g) *Browning index*: absorbance of an aqueous extract of cut tissue held for [time] at room temperature, [method agreed with the supervisor].

Population and sample size. No human or field population is involved; the sample is the fruit lot described above.

5. Data analysis

Means and standard deviations for every assay. One-way ANOVA with Tukey's post hoc test to compare varieties (H01) and agents (H02); Pearson correlation between PPO activity and browning index (H03), or Spearman correlation if the data are not normal. Significance at $p < 0.05$. Software: [name and version]. Biostatistics is taught in the MSCBCH core course MBC-007 (Bioinformatics and Biostatistics).

6. Significance of the study and implications for human life and environment

The results will show which locally sold variety browns least and which simple agent best slows browning, information a household, a canteen or a small fresh-cut unit can use. Less browning means less of the vegetable thrown away after cutting, which reduces food waste at the household level.

7. Future scope and further enhancement

The work can be extended to partial purification of the enzyme, to natural inhibitors from kitchen sources, to the phenolic profile of the same varieties, or to storage studies at different temperatures.

Time schedule

Month	Activity
1	Literature reading, standardising extraction and the PPO assay
2	Activity, protein and specific activity for all varieties
3	pH and temperature optima
4	Kinetics and anti-browning agents
5	Browning index, statistics, tables and figures
6	Writing, supervisor review, plagiarism check, binding or upload

The guidelines encourage at least 4 to 6 months of project work.

8. List of references

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Bradford, M. M. (1976). A rapid and sensitive method for the quantitation of microgram quantities of protein utilizing the principle of protein-dye binding. *Analytical Biochemistry*, 72, 248-254.

Lineweaver, H., and Burk, D. (1934). The determination of enzyme dissociation constants. *Journal of the American Chemical Society*, 56(3), 658-666.

Mayer, A. M. (2006). Polyphenol oxidases in plants and fungi: Going places? A review. *Phytochemistry*, 67(21), 2318-2331.

Mishra, B. B., Gautam, S., and Sharma, A. (2012). Purification and characterisation of polyphenol oxidase (PPO) from eggplant (*Solanum melongena*). *Food Chemistry*, 134(4), 1855-1861.

Mishra, B. B., Gautam, S., and Sharma, A. (2013). Free phenolics and polyphenol oxidase (PPO): The factors affecting post-cut browning in eggplant (*Solanum melongena*). *Food Chemistry*, 139, 105-114.

Plazas, M., Lopez-Gresa, M. P., Vilanova, S., Torres, C., Hurtado, M., Gramazio, P., Andujar, I., and others (2013). Diversity and relationships in key traits for functional and apparent quality in a collection of eggplant: Fruit phenolics content, antioxidant activity, polyphenol oxidase activity, and browning. *Journal of Agricultural and Food Chemistry*, 61(37), 8871-8879.

[Add the studies you read yourself, in the same format.]

The MBCP-001 guidelines set no referencing style; use one consistent format throughout the synopsis and the report.

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