

INTERNSHIP REPORT

Submitted in fulfillment of Internship at

PHYTOCHEMISTRY LABORATORY

SIDDHA CENTRAL RESEARCH INSTITUTE AND HOSPITAL

By

MONESHKUMAR R

(Reg No: 42910011)



Under the Guidance of

Dr. SHAKILA RAMACHANDARAN

(Research Officer at SCRI, CCRS)



DEPARTMENT OF CHEMISTRY

This is to certify that this Internship Report is the bonafide work of **R. MONESHKUMAR, Reg.No 42910011** who carried out the project entitled **“Phytochemistry laboratory”** under our supervision from **SEPTEMBER 16,2023 TO OCTOBER 09,2023.**

Head of the Department

Dr. J. KARTHIKEYAN MSc., PhD

Submitted for Viva-voce Examination held on **06/01/2024.**

Internal Examiner

Dr. T. ANAND

DEPARTMENT OF CHEMISTRY

External Examiner

Dr. P. PRIYADHARSHINI

**INTERNATIONAL RESEARCH
CENTRE**



சித்த மருத்துவ மைய ஆராய்ச்சி நிலையம்

சென்னை - 600 106

सिद्ध केंद्रीय अनुसन्धान संस्थान,

अण्णा सरकारी अस्पताल परिसर, अरुम्बाक्कम, चेन्नई - 600 106

SIDDHA CENTRAL RESEARCH INSTITUTE

(Central Council for Research in Siddha, Ministry of AYUSH, Govt. of India)

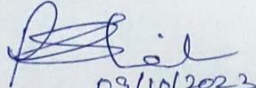
Anna Govt. Hospital Campus, Arumbakkam, Chennai - 600106

Phone: 044-2621 4925, Fax: 044-2621 4809

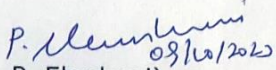
Date: 09-10-2023

Internship Certificate

This is to certify that **Mr. R. MONESH KUMAR**, 2nd Year student of M.Sc(Chemistry), Sathyabama Institute of Science and Technology, Chennai-600119, Tamil Nadu has undergone Internship in the Department of Chemistry, Siddha Central Research Institute (SCRI), Arignar Anna Hospital Campus, Chennai-600106 from 16.09.2023 to 09.10.2023. During the internship period, he attended all working days and showed great interest in learning the Chromatographic/ Analytical/HPTLC techniques related to Herbal Drug Analysis under the supervision of the head of the department.


09/10/2023
(Dr. R. Shakila)

Research Officer (Chemistry) & Head
Department of Chemistry


09/10/2023
(Dr. P. Elankani)

Research Officer (S)-Sci.-IV & I/c

INTRODUCTION

The Internship at the Siddha Central Research Institute and Hospital affiliated with Central Council for Research in Siddha (CCRS) for a period of **16th Sep 2023 to 09th Oct 2023**, provided me with a valuable opportunity to gain practical experience in the field of Phytochemistry Research works in Siddha medicine. This report outlines the tasks I undertook, the skills I developed, and the knowledge I gained during the internship period.

ORGANIZATION OVERVIEW

Siddha Central Research Institute was established in 1971 at Arumbakkam, Chennai, Tamil Nadu under the aegis of CCRS, Ministry of AYUSH, Govt. of India. This Institute houses facilities for trans-disciplinary research in Siddha system of medicine through various departments. The Department of literary research does collection, preservation, annotation, cataloguing, transcription and publication of palm leaf manuscripts and rare Siddha books.

The Phytochemistry Laboratory at Siddha Central Research Institute is dedicated to conducting research on the chemical constituents and properties of medicinal plants used in Siddha medicine. The laboratory employs advanced analytical techniques and state-of-the-art equipment to identify and isolate bioactive compounds present in herbal materials. Researchers investigate the phytochemical composition of Siddha formulations, study their pharmacological activities, and evaluate their safety and efficacy. This research work in the Phytochemistry Laboratory contributes to the standardization and quality control of Siddha medicines, as well as the discovery of new therapeutic compounds from natural sources. The findings from this laboratory help in establishing evidence-based practices in Siddha medicine and contribute to the growing body of knowledge in the field of phytochemistry and natural product research.

OBJECTIVES

The primary objectives of my internship were as follows:

a) To understand the principles and concepts of Siddha medicine, it is essential to explore its key elements and guiding principles.

b) To observe and assist in ongoing research projects conducted at SCRI.

To fulfill the objective of observing and assisting in ongoing research projects conducted at Siddha Central Research Institute (SCRI), interns are provided with opportunities to actively engage in various research activities.

Such as:

➤ **Research Project Observations:** Interns have the chance to observe and learn from ongoing research projects conducted by experienced researchers at SCRI. This exposure provides insights into the research methodology, experimental design, data collection, and analysis techniques employed in Siddha medicine research.

➤ **Data Collection and Analysis:** Interns may be assigned tasks related to data collection, including literature reviews. Also, they are encouraged to participate in the analysis of research data, assisting in organizing, interpreting, and summarizing the findings.

➤ **Laboratory Work:** Depending on the nature of the research projects, interns may be involved in laboratory work under the guidance of researchers. This can include preparing and analyzing Siddha formulations, conducting experiments to evaluate the pharmacological properties of medicinal plants, or performing biochemical assays to assess the efficacy of Siddha treatments.

➤ **Documentation and Reporting:** Interns are often responsible for documenting their observations and research activities. This involves maintaining accurate records, preparing progress reports, and summarizing their findings. It provides interns with an opportunity to enhance their scientific writing and communication skills.

c) To gain hands-on experience in the preparation and analysis of Siddha medicines. By gaining hands-on experience in the preparation and analysis of Siddha medicines, interns develop practical skills, enhance their knowledge of traditional formulation techniques, and gain a deeper understanding of the quality control and regulatory aspects of Siddha medicine. This experiential learning equips them with the necessary skills and competencies required for future research, formulation development, and the promotion of evidence-based practice in Siddha medicine.

d) To contribute to the research and development activities of the institute, so interns can make a valuable impact on the institute's research outcomes and contribute to the advancement of Siddha medicine. Their fresh perspectives,

dedication, and willingness to learn can foster a collaborative and dynamic research environment, benefiting both their own growth and the progress of the institute's research endeavors.

- e) To learn about the regulatory framework and ethical considerations in Siddha medicine research. By learning the regulatory framework and ethical considerations in Siddha medicine research, interns develop a strong understanding of the principles and guidelines that govern responsible research conduct. This knowledge equips them with the necessary skills and awareness to conduct research in an ethical, compliant, and transparent manner, ensuring the protection of research participants' rights and contributing to the credibility and advancement of Siddha medicine as a scientific discipline.

ACTIVITIES AND TASKS

During my internship, I was involved in various activities and tasks, including:

- a) Observing and assisting researchers in ongoing research projects.

We worked on Research works such as:

- Tests for determining the constituents present in Siddha medicine related plants and roots and the separation of products using Extraction and Column Chromatography.
 - Determining Solubility of Samples and medicines provided in water, alcohol and ash contents.
 - Determining of total soluble solids in the given samples and Contents in order to determine its consumability
- b) Preparing and analyzing Siddha formulations under the supervision of experts. Interns are provided with knowledge on research works done by research experts in the Organization.
 - c) Participating in discussions on Siddha medicine experiments and research works.
 - d) Assisting in the documentation and record-keeping of research activities.

EXPERIMENTS

1) COLUMN CHROMATOGRAPHY:

Column chromatography separates substances based on differential adsorption of compounds to the adsorbent as the compounds move through the column at different rates which allows them to get separated in fractions.



Thus, interns are provided with a plant sample and required to undergo products separation using column chromatography with the help of research staffs. The process undergone are:

- a) **Sample Preparation:** Interns receive a given sample that needs to be separated or purified using column chromatography. They work with experts to prepare

the sample by dissolving it in an appropriate solvent and ensuring it is free from any impurities that may interfere with the separation process.

- b) Column Packing:** Interns learn the process of packing a column with an appropriate stationary phase. This typically involves using a glass column and packing it with a solid support material, such as silica gel or a resin, which acts as the stationary phase for the separation. Interns are guided in the proper technique to ensure an even and compact packing.
- c) Sample Loading:** Interns carefully load the prepared sample onto the top of the packed column. They may use a suitable solvent or solvent mixture to dissolve the sample and ensure its complete adsorption onto the stationary phase. The sample is loaded using a syringe or pipette, and the column is carefully monitored to prevent sample leakage or air bubbles.
- d) Elution:** Once the sample is loaded, interns begin the elution process. They add a suitable solvent or solvent mixture to the column and collect the eluent fractions as they pass through the column. The eluent is carefully chosen based on the desired separation characteristics and the properties of the compounds in the sample. Interns closely monitor the elution process to collect the desired compounds in separate fractions.
- e) Fraction Collection and Analysis:** Interns collect the eluent fractions in separate vials or containers. These fractions represent different components of the sample that have been separated by the column chromatography. Interns

may analyze these fractions using various analytical techniques, such as thin-layer chromatography (TLC), high-performance liquid chromatography (HPLC), or spectroscopic methods, to determine the purity and identity of the separated compounds.

f) Evaluation and Documentation: Throughout the experiment, interns record observations, elution times, and any notable changes or observations. They maintain accurate documentation of the experiment, including the column packing procedure, elution conditions, and analytical results. This documentation ensures traceability and serves as a reference for future analysis and research.

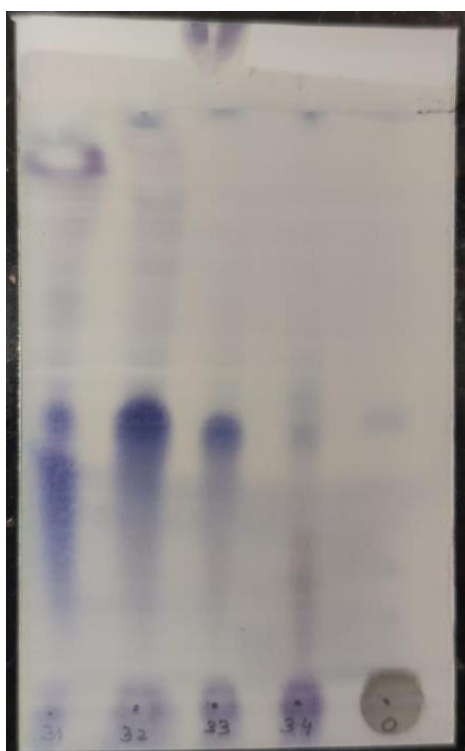
By conducting column chromatography experiments with a given sample, interns gain practical experience in the separation and purification of compounds. They learn about the factors that influence the separation process, such as column packing, solvent choice, and elution conditions. This hands-on experience provides interns with valuable skills in chromatographic techniques and enhances their understanding of the principles and applications of column chromatography in Siddha medicine research.

2) THIN LAYER CHROMATOGRAPHY:

During the internship at Siddha Central Research Institute (SCRI), interns are given the opportunity to gain hands-on experience with thin-layer chromatography

(TLC), a commonly used technique for qualitative analysis and compound identification. Under the guidance of experts, interns can conduct TLC experiments using a given sample. Here's an overview of the process:

- a) Sample Preparation:** Interns receive a given sample that needs to be analyzed using TLC. They work with experts to prepare the sample by dissolving it in a suitable solvent to obtain a concentrated solution. The sample is then filtered to remove any particulate matter or impurities that may interfere with the TLC analysis.
- b) TLC Plate Preparation:** Interns learn the process of preparing the TLC plates. They carefully select the appropriate stationary phase, typically a thin layer of adsorbent material such as silica gel or alumina, and coat it uniformly onto a glass or plastic plate. Interns ensure that the TLC plate is properly activated and dried before use to ensure optimal separation.
- c) Spotting:** Interns spot the prepared sample onto the TLC plate using a capillary tube or micropipette. They carefully apply a small volume of the sample solution as a spot on the starting line of the TLC plate. It is important to ensure that the spots are small and concentrated to avoid overlapping and smearing during the separation process.



- d) Development:** Interns place the spotted TLC plate in a developing chamber containing a suitable mobile phase or solvent system. The TLC plate is carefully positioned in the chamber to allow the solvent to rise up the plate through capillary action. The development process is monitored closely to prevent over-development or insufficient separation.
- e) Visualization and Analysis:** Once the development is complete, interns remove the TLC plate from the developing chamber. They visualize the separated spots on the TLC plate using appropriate visualization techniques. This may include exposing the plate to ultraviolet (UV) light, using chemical reagents, or staining with specific dyes. The separated spots are analyzed for

their positions, colors, and any additional characteristics that may aid in compound identification.

- f) Comparison and Interpretation:** Interns compare the separated spots on the TLC plate with reference compounds or known standards to identify the compounds present in the given sample. They consider factors such as the R_f (retention factor) values, spot colors, and other visual characteristics to make informed interpretations. The results are documented, and conclusions are drawn regarding the presence or absence of specific compounds in the given sample.

By conducting TLC experiments with a given sample, interns gain practical experience in qualitative analysis and compound identification. They learn about the principles of chromatography, the selection of stationary and mobile phases, and the interpretation of TLC results. This hands-on experience enhances their analytical skills and understanding of TLC as a valuable technique in Siddha medicine research.

3) ROTARY EVAPORATER AND WATER BATH DISTILLATION:

During the internship at a Siddha Research Institute, interns may have the opportunity to gain hands-on experience with rotary evaporators and water bath distillation for the purification and concentration of compounds. These techniques are commonly used in the extraction and isolation of active

components from plant materials or other samples. Here's an overview of the process:



- a) Sample Preparation:** Interns gather the sample from the column chromatography containing solvent and products that need to be purified or concentrated using a rotary evaporator or water bath distillation. By guidance of experts to prepare the sample, ensuring it is properly ground, crushed, or macerated to increase the surface area for efficient extraction.
- b) Setup and Operation:** Interns are trained in the setup and operation of the rotary evaporator or water bath distillation apparatus. They learn to assemble the necessary components, including the glassware, condenser, heating

element, and vacuum pump. The apparatus is properly connected, and all joints are securely tightened to ensure efficient operation.

- c) **Rotary Evaporation:** If working with a rotary evaporator, interns place the sample solution in a round-bottom flask and attach it to the rotary evaporator setup. The sample is then heated under vacuum, allowing the solvent to evaporate while leaving behind the desired compounds. The evaporated solvent is condensed in the condenser and collected separately.

- d) **Water Bath Distillation:** If using a water bath distillation setup, interns transfer the sample solution to a distillation flask and place it in a heated water bath. The water bath is gradually heated, causing the solvent to evaporate. The vapor is then condensed in a condenser and collected in a separate container.

- e) **Monitoring and Control:** Interns closely monitor the process throughout the distillation or evaporation. They regulate the temperature, vacuum level, and other parameters as needed to optimize the separation and prevent excessive heating or loss of volatile components. Regular checks are made to ensure the apparatus is functioning properly.

- f) **Collection and Analysis:** Once the distillation or evaporation process is complete, interns collect the purified or concentrated sample. They transfer it to suitable containers for further analysis or storage. The collected sample may

undergo additional analytical techniques, such as chromatography or spectroscopy, to confirm its purity and identify the desired compounds.

g) Cleanup and Maintenance: After the experiment, interns clean the glassware and equipment thoroughly to maintain cleanliness and prevent cross-contamination. They ensure that all components are properly stored and maintained for future use.

By gaining hands-on experience with rotary evaporators and water bath distillation, interns develop practical skills in the purification and concentration of compounds. They learn about the proper setup, operation, and monitoring of these techniques, as well as the importance of safety precautions. This experience enhances their understanding of the extraction and purification processes involved in Siddha medicine research and prepares them for further laboratory work in the field.

4) SOLUBILITY IN WATER AND ALCOHOL:

During the internship at a Siddha Research Institute, interns are given the opportunity to conduct experiments to determine the solubility of a given sample in water and alcohol. These experiments provide valuable information about the solubility characteristics of the sample and can guide the selection of

appropriate solvents for further analysis or formulation development. Here's an overview of the process:

- a) Sample Preparation:** Interns receive a given sample and prepare it for the solubility experiment. The sample is typically in solid form and may be in the form of powder, granules, or small particles. If necessary, interns crush or grind the sample to ensure uniformity.
- b) Solvent Selection:** Interns select two solvents for the experiment: water and alcohol. Water is a commonly used polar solvent, while alcohol (such as ethanol) is often used as a representative non-polar solvent. These solvents cover a broad range of solubility characteristics and provide valuable information about the sample's solubility behaviour.
- c) Solubility Testing:** Interns set up separate containers or test tubes and add a small amount of the sample to each. They then add water to one container and alcohol to another, creating two separate solutions. Interns ensure that the sample and solvent are thoroughly mixed by stirring or shaking the containers.
- d) Observation and Analysis:** After the samples are mixed with the solvents, interns observe and note the solubility behavior. We look for signs of dissolution, such as the disappearance of solid particles or the formation of a

clear solution. Interns assess the degree of solubility, ranging from completely soluble to partially soluble or insoluble, for each solvent.

- e) **Solubility Comparison:** Interns compare the solubility of the sample in water and alcohol. They evaluate which solvent resulted in better solubility or dissolution of the sample. This comparison provides insights into the sample's solubility characteristics and helps determine the most appropriate solvent for further analysis or formulation development.
- f) **Documentation and Analysis:** Interns document their observations, including the appearance of the solutions, the solubility behavior, and any other relevant information. They may also take photographs or record the results for future reference and analysis.

By conducting solubility experiments in water and alcohol, interns gain practical experience in assessing the solubility characteristics of a given sample. They learn about the influence of solvent polarity and other factors on solubility behavior. This hands-on experience enhances their understanding of the solubility properties of substances used in Siddha medicine research, aiding in the selection of appropriate solvents for extraction, formulation, and further analysis.

5) ASH CONTENT:

- ***Loss on Drying:***

During the internship at Siddha Central Research Institute (SCRI), interns are given the opportunity to conduct experiments to determine the loss on drying (LOD) of a given sample. The LOD test is commonly used to assess the moisture content of a substance, which is crucial for maintaining the quality, stability, and storage conditions of Siddha medicines. Here's an overview of the process:



a) Sample Preparation: Interns receive a given sample and prepare it for the LOD experiment. The sample is typically in solid form, such as powder or granules. Interns ensure that the sample is homogenous and representative of the entire batch to obtain accurate results.

- b) Weighing and Recording:** Interns accurately weigh a specific amount of the sample using an analytical balance. The weight of the sample is recorded as the initial weight (W1) before the drying process begins. This weight serves as the baseline for calculating the loss on drying.
- c) Drying Process:** Interns place the weighed sample in a suitable container, such as a pre-weighed crucible or a moisture determination apparatus. The container is then placed in an oven or drying chamber set at a specific temperature, typically between 110°C to 150°C. The sample is left to dry for a predetermined period, ensuring complete evaporation of moisture.
- d) Cooling and Weighing:** Once the drying period are complete, interns remove the container from the oven and allow it to cool in a desiccator to prevent moisture absorption from the surrounding environment. After cooling, the container is weighed again to obtain the final weight (W2) of the dried sample.
- e) Calculation and Analysis:** Using the initial and final weights, interns calculate the loss on drying using the following formula:

$$\text{LOD (\%)} = [(W1 - W2) / W1] \times 100.$$

The result represents the percentage of moisture lost during the drying process. Interns analyze the LOD value to assess the moisture content of the sample and evaluate its suitability for storage and formulation.

f) Documentation and Reporting: Interns document the entire experiment, including the initial and final weights, drying conditions, and calculations performed. They record any observations or notable changes observed during the drying process. The results are compiled and reported, highlighting the LOD value and its implications for the sample's quality and stability.

By conducting loss on drying experiments, interns gain practical experience in assessing the moisture content of a given sample. They learn about the importance of moisture determination in Siddha medicine research and the impact of moisture on the quality and stability of formulations. This hands-on experience enhances their understanding of proper drying techniques, documentation, and analysis, contributing to their overall proficiency in research and development activities at the Siddha Central Research Institute.

▪ ***Total Ash:***

During the internship at Siddha Central Research Institute (SCRI), interns are given the opportunity to conduct experiments to determine the total ash content of a given sample. The total ash test is commonly performed to assess the inorganic residue left behind after complete combustion of a substance. Here's an overview of the process:

a) Sample Preparation: Interns receive a given sample and prepare it for the total ash experiment. The sample is typically in solid form, such as powder or plant material. Interns ensure that the sample is representative and homogenous to obtain accurate results.



b) Weighing and Recording: Interns accurately weigh a specific amount of the sample using an analytical balance. The weight of the sample is recorded as the initial weight (W_1). This weight serves as the baseline for calculating the total ash content.

c) Ashing Process: Interns place the weighed sample in a suitable crucible or ashing dish. The crucible is then placed in a muffle furnace or a furnace set at a specific temperature, typically between 500°C and 600°C . The sample is subjected to controlled combustion, allowing the organic matter to burn off completely and leaving behind the inorganic ash.

d) Cooling and Weighing: Once the ashing process is complete, interns remove the crucible from the furnace and allow it to cool in a desiccator to prevent moisture absorption. After cooling, the crucible with the residual ash is weighed again to obtain the final weight (W2) of the ash.

e) Calculation and Analysis: Using the initial and final weights, interns calculate the total ash content using the following formula:

$$\text{Total Ash (\%)} = [(W2 - W1) / W1] \times 100.$$

The result represents the percentage of inorganic ash content in the sample. Interns analyze the total ash value to assess the inorganic residue present and evaluate its significance for quality control and standardization purposes.

f) Documentation and Reporting: Interns document the entire experiment, including the initial and final weights, ashing conditions, and calculations performed. They record any observations or notable changes observed during the ashing process. The results are compiled and reported, highlighting the total ash value and its implications for the sample's purity and quality.

By conducting total ash experiments, interns gain practical experience in assessing the inorganic content of a given sample. They learn about the importance of total ash determination in Siddha medicine research and the impact of inorganic impurities on

the formulation's quality. This hands-on experience enhances their understanding of proper ashing techniques, documentation, and analysis, contributing to their overall proficiency in research and development activities at the Siddha Central Research Institute.

- ***Water Soluble Ash (WSA):***

The Ash Obtained from the total ash experiment is subjected to the water-soluble ash experiment. The process occurs as follows:

- a) **Water-Soluble Extraction:** Interns transfer the ash from the crucible to a suitable container and add a known volume of distilled water. The mixture is stirred or shaken to ensure thorough mixing and dissolution of the water-soluble components present in the ash.
- b) **Filtration and Collection:** Interns filter the mixture using a filter paper or other suitable filtration apparatus to separate the water-soluble extract from the insoluble residues. The filtrate containing the water-soluble ash is collected in a clean container.



- c) Drying and Weighing:** The collected filtrate is transferred to a pre-weighed crucible or evaporating dish. The crucible is then heated gently to evaporate the water and dry the residue. Once the residue is dry, the crucible is weighed to obtain the final weight (W3) of the water-soluble ash.
- d) Calculation and Analysis:** Using the initial and final weights, interns calculate the water-soluble ash content using the following formula:

$$\text{Water-Soluble Ash (\%)} = [(W3 - W1) / W1] \times 100.$$

The result represents the percentage of inorganic ash content that is soluble in water. Interns analyze the water-soluble ash value to assess the water-soluble inorganic impurities present in the sample.

- e) Documentation and Reporting:** Interns document the entire experiment, including the initial and final weights, ashing conditions, filtration process, and calculations performed. They record any observations or notable changes observed during the experiment. The results are compiled and reported, highlighting the water-soluble ash value and its implications for the sample's purity and quality.

By conducting water-soluble ash experiments, interns gain practical experience in assessing the inorganic content of a given sample that is soluble in water. They learn about the importance of water-soluble ash determination in Siddha medicine research and the impact of water-soluble inorganic impurities on the formulation's quality. This

hands-on experience enhances their understanding of proper ashing techniques, filtration, documentation, and analysis, contributing to their overall proficiency in research and development activities at the Siddha Central Research Institute

- ***Acid Insoluble Ash:***

This Experiment uses ash formed from the total ash experiment similarly as water soluble ash experiment. The process occurs as follows:

- Acid Treatment:** Interns transfer the ash from the crucible to a beaker or suitable container. They add a specific volume of dilute acid, such as hydrochloric acid (HCl), to the container. The acid serves to dissolve the soluble inorganic components, leaving behind the acid insoluble impurities.
- Heating and Filtration:** The mixture of ash and acid is heated gently on a hot plate or heating mantle. This heating step ensures complete reaction between the acid and the soluble inorganic components. After heating, the mixture is filtered using a filter paper or other suitable filtration apparatus to separate the insoluble residue from the acid solution.
- Washing and Drying:** Interns wash the residue on the filter paper with distilled water to remove any remaining acid and soluble impurities. The washed residue is carefully transferred back to the crucible and dried in an oven or at a controlled temperature to remove any remaining moisture.

d) Weighing and Calculation: Once the residue is dry, the crucible with the acid insoluble ash is weighed to obtain the final weight (W3) of the acid insoluble ash. Using the initial and final weights, interns calculate the acid insoluble ash content using the following formula:

$$\text{Acid Insoluble Ash (\%)} = [(W3 - W1) / W1] \times 100.$$

The result represents the percentage of inorganic ash content that is insoluble in acid.

e) Documentation and Reporting: Interns document the entire experiment, including the initial and final weights, ashing conditions, acid treatment process, filtration, and calculations performed. They record any observations or notable changes observed during the experiment. The results are compiled and reported, highlighting the acid insoluble ash value and its implications for the sample's purity and quality.

By conducting acid insoluble ash experiments, interns gain practical experience in assessing the inorganic content of a given sample that is insoluble in acid. They learn about the importance of acid insoluble ash determination in Siddha medicine research and the impact of insoluble impurities on the formulation's quality. This hands-on experience enhances their understanding of proper ashing techniques, acid treatment, filtration, documentation

SKILLS AND KNOWLEDGE

During my internship at Siddha Central Research Institute, I had the opportunity to develop a range of valuable skills and expand my knowledge in Siddha medicine.

In terms of skills, through hands-on experience, I learned how to prepare and analyze Siddha formulations, which involved working with medicinal plants and understanding their properties and applications. This hands-on experience not only improved my technical skills but also enhanced my attention to detail and precision in conducting experiments.

Additionally, I developed strong research skills throughout the internship. I conducted literature reviews to gather relevant information, analyzed data using statistical methods, and honed my scientific writing abilities to effectively communicate research findings. These skills are vital in the field of Siddha medicine research as they contribute to the dissemination of knowledge and the advancement of the field.

Furthermore, my internship provided ample opportunities for effective communication and teamwork. I regularly interacted with experienced researchers and

collaborated with fellow interns, which enhanced my communication skills and fostered a collaborative mindset. I learned to articulate ideas, actively listen to others, and work collectively towards common research goals.

The internship also emphasized the importance of time management and organizational skills in a research environment. Balancing multiple tasks, meeting deadlines, and adapting to the dynamic nature of research projects helped me refine my ability to manage time effectively and organize my work efficiently.

In terms of knowledge, I gained insight into the regulatory and ethical considerations involved in Siddha medicine research and clinical trials. Understanding the ethical guidelines and regulatory frameworks governing research ensures the responsible conduct of studies and the protection of participants.

The internship also provided valuable knowledge about the standardization and quality control of Siddha formulations. I learned about the importance of ensuring the purity, potency, and safety of Siddha medicines through rigorous quality control processes

CONCLUSION

The internship at Siddha Central Research Institute, affiliated with Central Council for Research in Siddha (CCRS) was a valuable and enriching experience. I gained practical knowledge, developed essential skills, and expanded my understanding of Siddha medicine. The exposure to ongoing research projects and the opportunity to work alongside experienced researchers provided me with a solid foundation for my future career in the field of Siddha medicine.

I am grateful to the faculty members and staff at Siddha Central Research Institute for their guidance and support throughout the internship period. I would also like to express my appreciation to Sathyabama University for providing me with this valuable opportunity to enhance my knowledge and skills in Siddha medicine.

Overall, the internship at Siddha Central Research Institute was a fulfilling experience that has contributed significantly to my personal and professional growth. I am confident that the knowledge and skills I acquired will be instrumental in my future endeavors in the field of Siddha medicine.