List of publication

1. **Nandanwadkar, S. M., Hurkadale, P. J., Bidikar, C. M., & Godbole, M. M. (2021). Multielemental Analysis and In Vitro Evaluation of Free Radical Scavenging Activity of Natural Phytopigments by ICP-OES and HPTLC. Frontiers in pharmacology, 12, 396.**
    - The phytopigments derived from ethnomedicinal plants employed as traditional medicines appear to be the simplest alternative for artificial radical colorants. This can be because of persistent use of synthetic dyes and their harmful impacts linked to human lives as well as to the ecosystem. The literature evidences clearly reveal the complications from growing demands of radical colorants from artificial origin. The planned analysis work hence focuses on screening of the fundamental composition of phytopigments, obtained from plant sources by subtle technique of ICP-OES, with axial plasma combined with nebulizer motor-assisted gas flow approach, utilizing microwave digester for complete digestion of phytopigments, thereby establishing the pigments being safe for consumption. Additionally, the observations from free radical scavenging activity using DPPH by HPTLC concluded that the natural pigments obtained from plant sources are rich in flavonoids with potent antioxidant property. Thus, an effort has been made through the developed ICP-OES methodology, to beat the distinct imprecise practice of food labelling, once natural pigments are utilized in a variety of additives, as food colorants with amounts of components detected as arsenic, lead, and metal, within specified limits of FSSAI, demonstrate and establish safety of natural foodstuff agents, as compared over hazardous synthetic azo dyes.

2. **Nandanwadkar, S. M, Shivamurthy, M. V., & Karunakar, P. (2021). Novel Simultaneous Identification of Capsaicin and It's Quantification in Transferosome Formulation By HP-TLC Technique. Current Pharmaceutical Analysis, 17(1), 172-183.**
    - Capsaicin (8-methy-N-vanillyl-6-nonenamide), a potential analgesic derived from Capsicum annuum (Chili peppers), widely used from ancient times for its pharmacological activities such as anti-inflammatory, anti-oxidant and analgesic and provides relief from migraine and diabetes. But for obvious reasons, capsaicin cannot be administered directly. The present work was designed with a focus

to comply with mandatory requirement in various pharmacopeias to know the actual content of API present in final formulations. The formulation (TS3) consisting of 3% lipid, with 4:6 ratio of the polymer and solvent, was found to be the optimized formulation, which gave the best evaluation with regard to the particle size (97.03±2.68) nm, polydispersity index (0.20±0.00), higher zeta potential (61.28±2.06) mv, morphological studies and highest drug entrapment efficiency (68.34±4.24)%. The prepared transferosome formulation was subjected to characterization by validated HP-TLC method consisting of N-Hexane: Tert- Iso-butyl-methyl ether in ratio (5:15) v/v. Linearity was performed in the range of 50-1500 ng/spot with LOD/LOQ 50 ng and 150 ng. with regression analysis (R) of 99.91%. Recovery analysis was performed at 3 different levels at 80, 100 and 120 with an average recovery of 106.97%, respectively. Till now, no analytical method has been reported, associated with the characterization of pharmaceutical nano-forms (Capsaicin), like transferosomes. Thus, the maiden validated HP-TLC method for concurrent analysis of capsaicin as API in nano-transferosome may be employed in process quality control of formulations containing the said API.

3. **Hurkadale, P. J., Nandanwadkar, S. M., Bidikar, C. M., Patil, R. N., & Hegde, H. V. (2021). High-performance thin-layer chromatographic method development and determination of bio-enhancer from Piper trichostachyon: an ethnomedicinal plant. JPC–Journal of Planar Chromatography–Modern TLC, 1-8.**
    - Rare endemic ethnomedicinal plants that are indigenous to the Piperaceae family have an ancient history as traditional medicine in the treatment of diverse ailments like gastrointestinal disorders. The present research work highlights a digitally optimized, rapid, accurate and highly sensitive high-performance thin-layer chromatography (HPTLC) method for the simultaneous screening and quantification of piperine from ex-situ cultured callus, a kind of endangered Piper trichostachyon species. Analysis of piperine was performed on thin-layer chromatography (TLC) aluminum plates pre-coated with silica gel F254 as the stationary phase. Linear ascending development was carried out in a twin-trough glass chamber with a saturation pad. Developing phase comprising of n-hexane–ethyl acetate (5:15, V/V) was put to task.

Spectrodensitometric analysis of the plate was performed in absorbance mode at 342 nm using a CAMAG TLC Scanner IV. Compact bands for piperine with RF value of 0.50 ± 0.010 were recorded exhibiting a good linear relationship with R = 99.98% in the concentration range of 100–700 ng/spot with respect to the peak area. The proposed HPTLC method was validated in accordance with the International Council for Harmonization (ICH) guidelines for linearity, accuracy, precision, repeatability, reproducibility, limit of detection, limit of quantification, sensitivity, and specificity. The total piperine content was found to be 62.39 µg/mL in the wild plant and 41.57 µg/mL in the callus of P. trichostachyon. The chromatographic analysis concluded that the method developed and validated as a novel effort for the concurrent evaluation and comparative quantification of piperine in species of P. trichostachyon is reproducible and selective for the analysis of piperine.

4. **Nandanwadkar, S. M, & Vinayak S, M. (2020). A novel digitally optimized rapid quantification of carcinogenic aryl azo amines from various food matrices by HPTLC-MS. Journal of Liquid Chromatography & Related Technologies, 43(13-14), 445-454.**
    - A rapid, precise and reproducible high-performance thin-layer chromatography-mass spectroscopy (HPTLC-MS) method was developed and validated for identification and quantification of toxic aryl azo amines from chili oils, pickles and related food matrices using Merck thin-layer chromatography (TLC) silica gel F-254 plates, as a stationary phase adsorbent by CAMAG HPTLC system. Extraction of azo food colors was done using method specified as per ISO standard. The use of tert-butyl-methyl ether as final extraction solvent resulted in minimal sample clean up and high efficiency. Calibration was performed to combat matrix effect. Good linearity levels were observed for the concentrations of aniline, 2, 4-xylidine and 4 aminoazobenzene of 2–14 ppm per band. The limits of detection and quantification found for aniline, 2,4-xylidine and 4-aminoazobenzene were found to be 0.0015, 200, and 400 ppm and limit of quantification (LOQ) values were found to be 0.004, 600, and 1200 ppm, respectively, with a correlation coefficient of 99.94 %. This study thus highlights an economically viable, commercially sustainable yet highly scientific technique of HPTLC-MS methodology with structural elucidation of banned azo amines in

food and related products for their identification duly detectable at trace levels in a digitized form, which can enable material integrity-related prediction capacity of suspected food matrices.

5. **Nandanwadkar, S. M., & Mastiholimath, V. (2020). A novel USP-HPTLC protocol compliant method for the simultaneous quantification of E-102, E-124, and E-133 azo dyes in consumer goods. JPC–Journal of Planar Chromatography–Modern TLC, 33(4), 405-412.**
    - Azo dyes, in spite of being additives, are indeed an integral constituent of consumer goods with bio-therapeutic values. The addition of dyes is for consumer compliance which lends a sense of pleasing aesthetics to the consumption ready product, "a kind of placebo effect". Consequently, imperative need of the hour is felt to quantify such azo dyes due to complications like skin allergic reactions, genotoxicity, and ADHD symptoms leading to carcinogenicity in the long run, by apt analytical technique. In the proposed research, a pivotal USP-HPTLC compliant, validated, digitized method with multiple wavelength detection using TLC silica gel 60 F_{254} aluminum plates is developed. Mobile phase comprising of *n*-butanol–isopropanol–25% ammonia (GR grade)–water (65:20:10:5, *v/v*) has been put to task and subjected to spectro-densitometric scan for their simultaneous screening and quantification. Validation was done as per ICH and US FDA guidelines incorporating the latest 21 CFR approved, digital image CAMAG visionCATS software. The results revealed that the proposed method was highly sensitive with good linear relationship $R = 99.999\%$ and RSD of 0.456%. Thus, the method may be employed as standard quality control tool in consumer goods for characterization of azo dyes, which are still in the spectrum of doubt especially given the opaque data that surfaces on their safety profiles.

6. **Kannur, D., Nandanwadkar, S., Dhawane, S., Phulambrikar, S., & Khandelwal, K. (2017). Experimental evaluation of Hygrophila Schulli seed extracts for antistress activity. Ancient science of life, 37(1), 31.**
    - Stress is the causative factor for various diseases and disorders faced by majority of the diseased population. The seeds of Kokilākṣa Hygrophila schulli are attributed with Rasāyana properties as per

the Ayurvedic literature. Considering the above, the seed extracts of H. schulli were screened for antistress activity in animals. Aim: To investigate the adaptogenic activity of ethanolic and hexane extracts of Hygrophila schulli seeds using in vivo models. Materials and Methods: The ethanolic and hexane extracts of Hygrophila schulli were subjected to qualitative chemical analysis to detect the presence of various phytoconstituents. The extracts were subjected HPLC analysis. The chromatographic analysis was carried out which revealed the multicomponent and complex nature of the extracts. The seed extracts of H. schulli were screened for antistress activity using Swim Endurance test in mice and Cold-Immobilization Stress model in rats to ascertain the Adaptogenic potential. Results: HPLC analysis confirmed the presence of flavonoid Quercetin, the ethanolic and hexane extracts were found to increase the swim endurance time, both extracts lowered the elevated blood glucose, cholesterol as well as triglyceride levels in cold immobilization stress model and maintained normal homeostasis. Conclusion: Hygrophila schulli enhances the physical endurance as well as normalizes the body imbalance due to stressors. The seeds of Hygrophila schulli thus possess adaptogenic property.

7. **Nandanwadkar, S. M., Mastiholimath, V. S., & Surlaker, S. R. (2016). HPTLC Method Development and Validation of Antidiabetic Marker Compound from Polyherbal Formulation. Indian J. Pharm. Educ. Res, 50(4), 657-664.**
    - The objective of this research work was to develop a simple, rapid and reliable HPTLC method for standardization of anti-diabetic polyherbal formulation and to carry out validation of Trigonelline in formulation. Development of method was carried out by using Quercetin, Gallic Acid, Curcumin and Trigonelline as bioactive markers reported to have an anti-diabetic activity. Chromatographic analysis was performed using silica gel 60 F254 TLC plate, CAMAG Linomat 5 applicator and solvent system consisting of Isopropyl Alcohol: Ammonia: Acetone in the ratio 1:1:1. Densitometry scanning was performed under reflectance absorbance mode at 254 nm and 366 nm to identify the spots. Rf value of the marker compounds Quercetin, Gallic Acid, Curcumin and Trigonelline was found to be 0.66, 0.42, 0.81 and 0.34 respectively. Validation of Trigonelline was carried out in formulation as per ICH guidelines in terms of Linearity, Precision,

Repeatability, Specificity, Robustness, LOD, LOQ and Accuracy. No analytical method has been reported so far associated with a polyherbal formulation containing Quercetin, Gallic acid, Curcumin and Trigonelline focusing on anti diabetic activity. Thus this method can be used for routine quality control of raw material as well as formulation containing Trigonelline as one of its component.