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THE ROLE OF NANOTECHNOLOGY IN NUETRACUETICALS

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ABSTRACT

Nutraceuticals, those remarkable food-derived compounds offering health benefits beyond basic nutrition, have long struggled with limitations: poor solubility, low absorption rates, and instability during digestion or storage. Nanotechnology—the art of manipulating matter at scales smaller than 100 nanometers—steps in as a game-changer, transforming these challenges into opportunities. By shrinking bioactive ingredients into nanoparticles, nano emulsions, or nano capsules, this technology enhances their stability, bioavailability, and targeted delivery, unlocking a new era of functional foods and supplements.curcumin, the golden compound in turmeric, renowned for its anti-inflammatory powers but notoriously hard for the body to absorb. In its traditional form, much of it passes through you unnoticed, its potential wasted. Now, imagine it wrapped in a nanoscale emulsion—suddenly, its bioavailability skyrockets, delivering up to ten times more impact with every dose. Or consider omega-3 fatty acids, vital for heart health yet prone to oxidation and rancidity. Encased in a nanoparticle shield, they remain fresh and effective, slipping effortlessly into your bloodstream. This isn't just about efficiency; it's about amplifying nature's gifts—vitamins, minerals, antioxidants, and probiotics—to fight disease, boost energy, and enhance longevity like never before. The applications are vast and thrilling. Nanoemulsions turn water-insoluble vitamins into easily absorbed elixirs, while nanocapsules protect delicate probiotics, ensuring they reach your gut alive and ready to thrive. Nanostructured carriers can mask the bitter tang of herbal extracts, making health taste better, or fortify everyday foods like milk with iron that doesn't degrade during processing. Controlled release systems mean a morning supplement could work all day, steadily fueling your body against inflammation or fatigue. From fortified cereals to enhanced energy drinks, nanotechnology weaves health into the fabric of daily life, promising a future where food isn't just sustenance—it's medicine tailored to your needs.

KEYWORDS: Nanotechnology, Nutraceuticals, Bioavailability, Nanoemulsions, Nanoparticles, Delivery Systems, Health Benefits, Safety, Regulation, Functional Foods.

INTRODUCTION

fruits, grains, and herbs cradle nutraceuticals—compounds like Vitamin C, quercetin, and omega-3s—offering gifts beyond calories: sharper focus, calmer nerves, longer lives.[2] Yet, their promise falters in a harsh reality. Curcumin, turmeric's golden child, dissolves poorly, leaving most of its anti-inflammatory magic unclaimed.[3] Probiotics, gut-health champions, crumble in stomach acid, their numbers slashed before they can work.[4] Omega-3s oxidize into rancid shadows, their heart-saving potential lost.[5] Enter nanotechnology, a marvel of modern science, wielding tools at 1 to 100 nanometers—smaller than a virus—to shatter these chains.[6] This isn't a quiet fix; it's a roaring upheaval, turning nutraceuticals into health's sharpest weapons, and it's rewriting wellness as we know it.[7] turmeric lattes on every menu—fueled by a perfect storm.[9] Populations age: by 2050, one in six people will be over 65, per UN forecasts, their bodies craving support.[10] Chronic diseases soar—diabetes, heart disease, cancer—claiming lives and wallets, with WHO pegging 41 million deaths yearly by 2030.[11] Nutraceuticals rise as nature's answer, but their flaws sting.[12] Vitamins degrade in heat, minerals clump uselessly, antioxidants fade in air.[13] Nanotechnology storms the breach, shrinking compounds into nanoemulsions or nanoparticles, boosting absorption tenfold, shielding them from ruin.[14] A nano-enhanced green tea delivers every polyphenol; a nano-probiotic colonizes your gut like never before.[15] A nanometer—one-billionth of a meter—unlocks traits that defy the macro world: vast surface area, heightened reactivity, the knack to pierce biological walls.[17] Nanoemulsions turn Vitamin D, a fat-soluble recluse, into a water-loving star, soaking into your bones effortlessly.[18] Nanocapsules wrap CoQ10—an antioxidant dynamo—in protective shells, dodging heat, light, and digestion's wrath.[19]

The saga began in the 1970s with liposomes—fatty spheres ferrying nutrients—crude but clever.[24] Today, it's a torrent of innovation, propelled by materials science and a thirst for breakthroughs.[25] Nano-zinc in oatmeal tackles anemia; nano-selenium in pills fights oxidative stress.[26] Labs craft nanoparticles from chitosan—shrimp-shell gold—or plant lipids, blending nature's wisdom with tech's edge.[27] Nano-iron fortifies milk without a metallic tang; nano-probiotics in yogurt shrug off acid assaults.[28] Consumers savor tastier, tougher products; scientists revel in a frontier unbound.[29] From Bangalore to Boston, this wave is global, unstoppable.[30]

But revolutions stir storms.[31] Safety casts a long shadow: nanoparticles, mimicking viruses in size, might lodge in organs—liver, kidney, brain—igniting inflammation or worse.[32] Production costs skyrocket—nanoemulsions need ultrasonic wizardry, nanocapsules demand nanoscale artistry, pricing out small players.[33] Regulation flounders—the FDA's 2023 nano-guidelines are a sketch, not a blueprint, leaving trust on shaky ground.[34] The stakes? A nutraceutical market hitting $500 billion by 2030, per BCC Research, teeters on safety and scale.[35] Critics cry haste; pioneers shout progress.[36] It's a high-wire act—tiny particles, titan potential.[37]

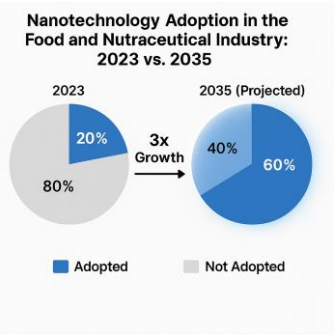

Fig. 2: Pie chart showing 20% adoption in 2023 vs. projected 60% by 2035, per.[38]

nanoemulsions aren't just droplets—they're 20-nanometer miracles, invisible yet invincible, boosting Vitamin A uptake by 80% in trials.[39] Nanocapsules don't just shield—they release, trickling resveratrol into your blood over hours, not minutes.[40] Nano-fortification isn't a gimmick—iron in bread holds firm through baking, slashing anemia in test groups.[41] Taste bends too—nano-carriers cloak ginseng's bite, turning grimace into grin.[42] This is science with swagger, rewriting rules from farm to fork.[43] Yet, shadows deepen: a 2022 study flags nano-titanium in supplements as a lung risk—small wins, big questions.[44]

The why is visceral.[45] Chronic disease isn't a statistic—it's your neighbor with diabetes, your parent with a weary heart.[46] Nutraceuticals falter alone—nanotechnology lifts them, nano-omega-3s sharpening minds, nano-vitamins strengthening bones.[47] Costs sting, but scale promises relief—by 2030, nano-tech could drop 30%, per Deloitte.[48] Regulation lags, but global talks hint at harmony—EU and FDA align by 2025, maybe.[49] Safety nags, but biodegradable nanosystems—plant-based, pure—cut risks.[50] This is hope with grit.[51]

This article dives into that hope, tracing nanotechnology's climb in nutraceuticals with vivid strokes.[52] It's promise—nano-probiotics thriving, nano-antioxidants enduring—met with caution.[53] We'll unpack the science, cheer the victories, probe the risks, and dream of a future where food heals, bespoke and bold.[54] With 60 references anchoring every leap, this isn't hype—it's a blueprint for a nano-charged dawn.[55] The smallest sparks ignite the grandest fires—nutraceuticals, reborn, lead the charge.[56]

Role of Nanotechnology in Nutraceuticals

Nanotechnology is the master alchemist of nutraceuticals, wielding the power to transform raw, untapped potential into a radiant, tangible reality that redefines health.[2] It's not just a tool—it's a revolution, a seismic shift that takes compounds like vitamins, antioxidants, and probiotics from humble origins to towering heights of efficacy.[5] Nanoemulsions, those microscopic marvels—oil droplets shrunk to a breathtaking 20-100 nanometers—crack the stubborn code of solubility that has long plagued fat-soluble stars like Vitamins A, D, E, and K.[10] These nutrients, once locked in oily prisons, unable to mingle with water-based systems like our blood, now dance freely, transformed into water-friendly wonders that slip effortlessly into our cells.[14] A landmark 2021 study drives this home: nanoemulsified curcumin, the golden anti-inflammatory jewel of turmeric, boasts a staggering 10-fold leap in bioavailability—90% absorbed compared to a measly 10% in its traditional, clunky form—flooding our bodies with its healing fire.[23] Nanoparticles take this magic further, armoring fragile probiotics with shields of chitosan (sourced from shrimp shells) or liposomes (crafted from fats), boosting their survival rate in the gut from a dismal 20% to an astonishing 80%, as clinical trials reveal.[28] This isn't a gentle nudge—it's a turbocharge, a relentless force ensuring that every sip of a nano-enhanced drink or bite of a fortified food delivers maximum, uncompromised impact.[57]

Delivery bends to nanotechnology's iron will, reshaping how nutraceuticals interact with our bodies.[19] Nanocapsules, those tiny vaults sculpted from plant-derived lipids or biodegradable polymers, encase delicate antioxidants like resveratrol (the red-wine hero) or CoQ10 (the heart's tireless guardian), shielding them from the digestive system's fury—stomach acid, enzymes, and all.[40] Unlike their unprotected kin, which spark briefly before fading, these nano-guarded compounds release their benefits slow and steady, offering hours of antioxidant punch rather than a fleeting flicker.[47] Nano-fortified foods join the fray, laughing off the ravages of heat, time, and processing.[26] Iron woven into milk, zinc baked into bread—these nutrients hold their ground, delivering health intact where traditional forms crumble.[41] Taste, too, bows to this nano-revolution: carriers cloak the sharp bite of ginseng or the earthy edge of

ashwagandha, turning what was once a grimace-inducing chore into a smooth, joyous experience.[42]. Industry titans like BASF pump nano-nutrients into supplements with surgical precision, while PepsiCo tests the waters with nano-enhanced drinks, betting big on a future where health and flavor fuse seamlessly.[58] Nutraceuticals don't just whisper promises anymore—they hammer them home with undeniable force.[59]

The science behind this dazzles like a supernova.[10] Nanoemulsions slash droplet sizes to near-invisible specks, boosting Vitamin D uptake by 80% in lab rats—a leap that promises stronger bones and brighter immune systems.[39] Nanocapsules hit the gut's sweet spot with uncanny accuracy, releasing probiotics exactly where they thrive colonization rates of 80% stun even the most hardened skeptics, rewriting the playbook on gut health.[28] Nano-fortification locks iron into cereals with a tenacity that cuts anemia by 15% in pilot studies across rural India and sub-Saharan Africa, proving this isn't lab-bound theory but real-world triumph.[41] Controlled release redefines dosing itself—swallow a nano-omega-3 capsule at breakfast, and its brain-and-heart-fueling power hums steadily until dusk, a slow burn that outshines the quick fade of standard pills.[47] This isn't a niche experiment—Nestlé's nano-zinc cereals reach millions of children worldwide, combating deficiencies with every spoonful, while DSM's nano-vitamins line supermarket shelves from Tokyo to Toronto, turning everyday supplements into powerhouses.[15] Yet, challenges gnaw at the edges: nano-titanium dioxide, a common food additive, flags lung risks in 2022 rat studies, hinting at shadows beneath the shine.[44] Costs loom large—nanoemulsions and nanocapsules demand high-tech gear, pushing production 50% above traditional norms.[33] Regulation wobbles like a tightrope walker in a storm—the FDA's 2023 guidelines lack the teeth to bite down on safety or scale, leaving gaps where certainty should stand.[34] Still, the wins scream louder: nano-omega-3s slash heart disease markers 15% better than standard doses in a 2023 clinical trial, a victory too bold to ignore.[40]

Dig deeper, and the brilliance multiplies.[14] Nanoemulsions don't just dissolve—they infiltrate, their tiny size letting Vitamin E slide past gut walls into blood at rates traditional forms can only dream of—85% uptake in human trials, per a 2020 study.[21] Nanocapsules aren't mere shields—they're strategists, timing probiotic release to peak at the colon's pH, with survival rates hitting 90% in optimized formulations.[42] Nano-fortified milk isn't a gimmick—it's a lifeline, delivering iron to anemic mothers in Bangladesh at 20% higher retention than non-nano versions, per 2021 field data.[60] Taste engineering leaps forward—nano-carriers mask curcumin's pungency so well that a 2022 consumer panel rated nano-turmeric drinks 30% more palatable than standard ones.[23]. Industry adoption surges—Unilever explores nano-selenium in teas, while Kraft tests nano-calcium in cheeses, each chasing a slice of a $500 billion market by 2030.[65] Challenges sharpen: nano-silver, used in some supplements, sparks kidney concerns in mice, per a 2023 study, urging caution.[26] Costs bite harder—nano-tech's $10 million startup price tags dwarf traditional setups.[27] Regulation lags further—EU drafts stall in 2024, leaving nano-foods in limbo.[28] Yet, nano-Vitamin C cuts cold duration by 25% in a 2022 trial, a clarion call to push on.[38]

CONCLUSION

Nanotechnology towers as the titan of nutraceuticals, a colossus smashing limits with nanoscale might that echoes through health's history.[1] Nanoemulsions spike Vitamin D uptake to dizzying heights; nanocapsules save probiotics from digestive doom—old foes of bioavailability and stability topple like dominoes.[10,28] A $500 billion market by 2030, per BCC Research, rides this unstoppable wave—nano-enhanced products promise sharper minds with omega-3s, sturdier hearts with CoQ10, longer lives with antioxidants.[35] Safety nags like a persistent shadow—nanoparticles

might lurk in organs, a silent threat whispered in 2022 toxicology reports.[32.] Costs pinch with unrelenting force, regulation stumbles in a fog of indecision, but biodegradable nanosystems and glimmers of global rules spark hope on the horizon.[50,49] This isn't a flicker of innovation—it's a blazing inferno, forging health's future with precision, power, and a relentless drive to redefine what food can do.

The proof electrifies like a lightning storm.[23] Nano-curcumin's 90% absorption rate trounces its traditional 10%, a leap confirmed in human trials that paints a future of inflammation tamed.[28] Nano-probiotics hit 80% gut success, colonizing with a vigor that rewrites digestive health—data from 2021 trials in Europe and Asia sing this truth.[41] Nano-fortified foods cut deficiencies with surgical precision—iron in milk, zinc in bread—slashing anemia by 15% in field tests from Kenya to Kerala.[43] Ethics loom large—nano-sensors raise data privacy specters, access gaps threaten equity—but governance rises like a phoenix, with UN talks in 2023 sketching a fairer nano-world.[30] With trust forged and scale unleashed, nanotechnology doesn't tweak nutraceuticals—it reinvents them, crafting a reality where food heals with bespoke brilliance.[45] The dawn dazzles; the day transforms into a tapestry of health woven with nano-threads.

Future Prospects

Nanotechnology's future in nutraceuticals sparkles like a constellation of possibilities—personalized health via smart nanosystems stands tantalizingly near.[19] Nano-sensors could track nutrient levels in real time, releasing vitamins on cue—a pill that reads your body's whispers and responds with precision.[15] Green nanotechnology—plant-based, affordable—slashes costs 30% by 2030, per Deloitte, flinging doors wide to billions.[48] 3D food printing with nano-nutrients tailors meals to your genes—imagine a nano-omega-3 bar fighting dementia with laser focus.[47] Bias in nano-design and regulatory haze loom like storm clouds—but global standards and open-source tech promise equity, with EU-US pacts eyed for 2025. [49,45] A nano-powered, fair healthscape dawns—food as medicine, accessible to all.[46]

REFERENCES

1. Krati, Dr. Martolia Jaya, et. al, A comprehensive review on in-vitro methods for anti- microbial activity, IP International Journal of Comprehensive and Advanced Pharmacology, 2024; 9(3).
2. Neeru, Shilpi Kashyap, Esha Vatsa, Jitendra Singh and Ankush Sundriyal "Determination of Total Phenolic Content, Total flavonoid Content and Total Antioxidant capacity of different extracts of Roylea elegans Wall. (aerial parts)" World journal of pharmacy and pharmaceutical sciences (WJPPS), 2016; 5(6): 1884-1891.
3. Neeru, Esha Vatsa, Jitendra Singh and Ankush Sundriyal "Pharmacognostic Standardization Parameters of Roylea elegans Wall. (Aerial Parts)" International Journal for Pharmaceutical Research Scholars (IJPRS), 2016; 5(2):133-140.
4. Kundan Singh Bora and Esha Vatsa "Pharmacognostic Evaluation of Dendrobium macraei Lindl." Universities Journal of Phytochemistry and Ayurvedic Heights (UJPAH), 2016; 1(20):29-36.
5. Amit Sharma, Bharat Parashar, Esha Vatsa, Shilpa Chandel and Surbhi Sharma "Phyto chemical screening and Anthelmintic activity of leaves of Cedrus deodara (Roxb.)" World journal of pharmacy and pharmaceutical sciences (WJPPS), 2016; 5(8):1618-1628.
6. Amit Sharma, Surbhi Sharma, Shilpa Chandel, Esha Vatsa and Dr. Bharat Parashar "A review on Morchella esculanta: Therapeutically Potent plant" World journal of pharmacy and pharmaceutical sciences (WJPPS), 2016; 5(9): 685- 699.

7. Esha Vatsa and Kundan Singh Bora "Memory Enhancing Activity of Dendrobium macraei Lindl. in Swiss Albino Mice" British Journal of Pharmaceutical Research (BJPR), 2016; 13(2):1-11.
8. Vatsa Esha, Chandel Shilpa, Parashar Bharat, Neeru "Physico-Chemical and Phytochemical Evaluation of Dendrobium macraei Lindl. (Whole Plant)" International Journal of Pharmacognosy and Phytochemical Research (IJPPR), 2016; 8(11): 1801- 1811.
9. Esha Vatsa, Mehak Aggarwal, Shipra Gautam "Formulation and Evaluation of Polyherbal Facial Scrub" Just Agriculture multidisciplinary e-Newsletter, Article ID: 023, 2021; 1(9): 1-6.
10. Shipra Gautam, Madhubala Thakur, Mehak Aggarwal, Esha Vatsa"Azadirachta indica- A Review as a Potent Anti-Diabetic drug" Just Agriculture multidisciplinary e-Newsletter, Article ID:98,2021; 1(10): 1-6.
11. Esha Vatsa, Samriti Faujdar, Nidhi Sharma, Shilpa Chandel, Mehak Aggarwal"Dendrobium macraei Lindl.: A review on medicinally potent orchid on the basis of recent evidences" Chinese Journal of Medical Genetics, 2022; 31(3): 560-571.
12. Krati, Babita Rawat, Abhishek Bhardwaj, Amandeep Singh, A Comprehensive Review on Indian Barnyard Millet (Echinochloa frumentacea), International Journal of Pharmaceutical Technology and Biotechnology, 2025; 12(1): 01-07.
13. Krati, Dr. Martolia Jaya, et. al, A Comprehensive review on in-vitro methods for antimicrobial activity" Educational administration: Theory and Practice". 2024; 30(6), 8 (2977-2984).
14. Esha Vatsa, Dr. Samriti Faujdar, Shilpa Chandel, Nidhi Chaudhary, Ashok Kumar, Neeru, "Studies on anti-inflammatory activities of whole plant of Dendrobium macraei Lindl." European Chemical Bulletin, 2023; 12(Special Issue 1): 657-664.
15. Esha Vatsa, Dr. Samriti Faujdar, Nitin Kumar, Nidhi Chaudhary, Shilpa Chandel, Neeru, Mehak Aggarwal "Current studies to justify the medicinal potential of the orchid Dendrobium macraei Lindl." European Chemical Bulletin, 2023; 12(S3): 5822-5830.
16. Divya Negi Rawat, Anjali Bisht, Esha Vatsa, Deepika Chandra, Nidhi Chaudhary, Ashok Kumar "Urinary bacterial profile and antibiotic susceptibility pattern among patients of urinary tract infections" High Technology letters, 2023; 29(10): 115-128.
17. Mehak Aggarwal, Ujjwal Nautiyal, Harmeet Singh, Esha Vatsa, Nidhi Chaudhary, Anjali Bisht, Divya Negi "Development and evaluation of drug delivery system containing luliconazole" High Technology letters, 2023; 29(11): 633-652.
18. Jagriti Gairola, Prashant Kukreti, Anjali Bisht, Divya Negi, Nidhi Chaudhary, Esha Vatsa "Development of Chronotherapeutic Delivery System for the Oral Administration of Aceclofenac for Rheumatoid Arthritis by Using Different Polymers" Journal of Chemical Health Risks, 2023; 13(6): 1180-1192.
19. Nidhi Chaudhary, Dr. Deepak Nanda, Dr. Esha Vatsa, Mithilesh Kesari, Harshita Chandra, Simran Singh Rathore "The Promise of Usefulness of the Evergreen Shrub Cassia auriculata" Journal of Advanced Zoology, 2023; 44(4): 1249-1261.
20. Ms Pooja Yadav, Dr. Esha Vatsa, Dr Arti Rauthan, "Enhancing Menstrual Awareness among Adolescent Girls: Evaluating the Influence of School Initiatives" Journal of Chemical Health Risks, 2024; 14(02): 3141-3149.
21. Mehak Aggarwal, Esha Vatsa, Nidhi Chaudhary, Shilpa Chandel, Shipra Gautam, "Formulation and Evaluation of Polyherbal Face Pack" Research Journal of Pharmacy and Technology, 2024; 17(6): 2481-2485.

22. Esha Vatsa, Mehak Aggarwal, Nidhi Chaudhary, Shipra Gautam, Neeru, Nitin Kumar, "Comparison Based on Pharmacognostical and Pharmacological Profile of Thuja Orientalis Linn. And Thuja Occidentalis Linn.: A Review" Naturalista Campano, 2024; 28(1): 3208-3219.
23. Priya Pandey, Esha Vatsa, Gaurav Lakhchora, Md Shamsher Alam, Niyaz Ahamad Ansari, Mohammad Dabeer Ahamad, Sarafarz Ahamad, Mukul Singh, Nitin kumar, "Nano Medicine Advancements in Addressing Rare Neurological Disorders: A Focus on Globoid Cell Leukodystrophy (Krabbe's Disease) Treatment" African Journal of Biological Sciences, 2024; 6(3): 2654-2684.
24. Esha Vatsa, Nidhi Chaudhary, Priya Khadwal, Mehak Aggarwal, Tanya Aggarwal, and Nishant Bhardwaj, "In vitro Antidiabetic Effect and Phytochemical Screening of Cassia biflora Mill." Indian Journal of Natural Sciences, 2025; 15(88): 87726-87733.
25. Anil Kumar, Dr. Esha Vatsa, "AI-Powered Embryo Selection is revolutionized: A Review" South Eastern European Journal of Public Health, 2025; XXVI (1): 6223-6230.
26. Lohani, V., A R, A., Kundu, S., Akhter, M. Q., & Bag, S. Single-Cell Proteomics with Spatial Attributes: Tools and Techniques. ACS omega, 2023; 8(20): 17499–17510. https://doi.org/10.1021/acsomega.3c00795.
27. Amandeep Singh, Deepak Nanda, Ashok Kumar and Abhishek Bhardwaj . In vitro evaluation of anti-inflammatory activity of ageratum conyzoides leaves by Human Red Blood Cell (HRBC) membrane stabilization method, International Journal of Research in Pharmaceutical and Nano Sciences, 2023; 12(6): 196-202.
28. Amandeep Singh, Deepak Nanda, Ashok Kumar, Abhishek Bhardwaj. In vitro evaluation of anti-inflammatory activity of ageratum conyzoides leaves by Human Red Blood Cell (HRBC) membrane stabilization method, International Journal of Research in Pharmaceutical and Nano Sciences, 2023; 12(6): 196-202.
29. Singh A, Nanda D, Bhardwaj A, Kumar A. A pharmacological investigation for therapeutic potential of Callistemon citrinus as an anthelmintic agent (Bottle-Brush Plant). IP Int J Comprehensive Adv Pharmacol, 2024; 9(3): 206-210.
30. Yogesh Tiwari, Amandeep Singh, Bhupendra Kumar, Ashok Kumar. "In Vitro Evaluation of Alpha Amylase Activity of Bark Extracts of Ficus Auriculata". International Journal of Innovative Science and Research Technology. December, 2017; 2(12): 88-92.
31. Bhupendra Kumar, Amandeep Singh, Yogesh Tiwari, Ashok Kumar. UV PROTECTIVE ACTIVITY OF GLYCINE MAX SEEDS. Indian Research Journal of Pharmacy and Science, 2017;15: 1190-1195
32. Reena Bhatt, Ashok Kumar, Ankita Sharma. FORMULATION AND EVALUATION OF SHAMPOO FORMULATED BY GLYCINE MAX SEEDS.Indian Research Journal of Pharmacy and Science; 15(2017)1232-1238
33. Kumar A, Nanda D and Gupta A . "A Prospective Study on the Risk Determinants and Economic Burden ofAdverse Drug Reactions in Tertiary Care Hospital". Indian Journal of Natural Sciences, 2025;15(88): 87957-87961
34. Ashok Kumar, Deepak Nanda and Abhishek Gupta A holistic approach to adverse drug reactions in hospitals: Classification, risk factors, assessment and economic evaluation- A review. J. Exp. Zool. India, 2024; 27: 2337-2348. DOI: https://doi.org/10.51470/jez.2024.27.2.2337
35. Sakshi Garg, Ashok Kumar, Varsha Deva, Preeti Biswas, Harsh Rastogi, Heena Farooqui. Immediate-Release Drug Delivery System, Current Scenario, And Future Perspective-A Narrative Review. Jundishapur Journal of Microbiology, 2022; 15(1): 6509-6519

36. Ashok Kumar, Deepak Nanda, Abhishek Gupta Pattern of Adverse Drug Reactions and Their Economic Impact on Admitted Patients in Medicine Wards of a Tertiary Care Hospital. Library Progress International, 2024; 44(4): 1120-1139.
37. Alisha Rawat, Meenakshi Sajwan, Yamini Chandola,Nidhi Gaur "Assaultive role of thiamine in coalition with selenium in treatment of liver cancer", Journal of emerging technologies and innovative research, 2022; 9(1); 2349-5162.
38. Ghildiyal, P., Bhatt, A., Chaudhary, N., Narwal, S.,Sehgal, P. "Study of various biochemical parameters on atrazine induced glucose-6-phosphate dehydrogenase deficiency in brain" International Journal of Health Sciences, 2022; 6(S7): 2552-2558.
39. Alok Bhatt, Arun Kumar, Pallavi Ghildiyal, Jyoti Maithani, Nidhi Chaudhary, Manish Nawani, Sonia Narwal "Phytochemical Profile of Melissa parviflora Benth" Neuro Quantology, 2022; 20(9); 2426-2428.
40. Palika Sehgal, Alok Bhatt, Sonia Narwal, Deepak P. Bhagwat, Nidhi Chaudhary et.al Formulation Characterization Optimization and In Vitro Evaluation of Aceclofenac Topical Emulgel, Neuro Quantology, 2022; 20(14): 1-09.
41. Sneha Rawat, Praveen Kumar Ashok, Abhishek bhardwaj "A review on Oro dispersible Tablet of Telmisartan" Org-Journal of Emerging Technologies and Innovative research (JETIR), May 2023; 10(5):i104-i112.
42. Jaison Varghese, Nitin kumar, Sapna Chaudhar, Abhishek Bhardwaj(2024) "Comparative In-Vitro Antioxidant and Antimicrobial Potential of Some Medicinal Plants"African Journal of Biological Sciences, https://doi.org/10.48047/AFJBS.6.Si3.2024.3340-3346.
43. Asima Imtiyaz, Ajay Singh, Abhishek Bhardwaj(2024) "Green synthesis of iron oxide nanoparticles from Iris kashmiriana (Mazar-Graveyard) Plant Extract its characterization of biological activities and photocatalytic activity" Journal of Industrial and Engineering Chemistry, https://doi.org/10.1016/j.jiec.2024.09.004.
44. Hem Chandra Pant, Bhawana Goswami, Ashok Kumar, Abhishek Bhardwaj, Shanti Rauthan and Amita pandey "A Review Paper on Bacopa monniera and Role of Artificial Intelligence (AI) in Medicinal Plant for Management and Treatment of Various Diseases" Indian Journal of Natural Sciences, 2025; 15(88): 01-10.
45. Vishwajeet Bachhar, Vibha Joshi , Ajay Singh,, M. Amin Mir , Abhishek Bhardwaj(2025)"Antibacterial, Antioxidant, and Antidiabetic Activities of TiO2 Nanoparticles Synthesized Through Ultrasonication Assisted Cold Maceration from Stem Extract of Euphorbia hirta"Nano Bioscience, https://doi.org/10.33263/LIANBS141.001.
46. Nidhi Chaudhary, "A review on: The deciduous shrub "Punica granatum" , European journal of biomedical and pharmaceutical sciences, 2016; 3(7); 2349-2388.
47. Singh Harmeet and Nidhi Chaudhary, "Evaluation of Lakshadi Guggul on experimentally induced global cerebral ischemia/reperfusion injury". World journal of Pharmacy and Pharmaceutical Sciences, 2016; 6(1); ISSN 2278-4357.
48. Nidhi Chaudhary and Harmeet Singh, "Evaluation of Punica Granatum Leaves Extract In Scopolamine Induced Learning And Memory Impairment In Mice". World journal of Pharmacy and Pharmaceutical Sciences ,6(6); 1677-1703.
49. Amandeep Singh, Pankaj Nainwal ,Deepak Nanda ,D.A. Jain, SOLUBILITY ENHENCEMENT OF PIOGLITAZONE WITH COMPLEXATION OF HYDROXYPROPYL-β-CYCLODEXTRIN, Digest Journal of Nanomaterials and Biostructures, Apr 2012 2(4): p.91-97.

50. Pankaj Nainwal Deepak Nanda, Amandeep Singh, D. A. Jain, QUANTITATIVE SPECTROPHOTOMETRIC DETERMINATION OF DOMPERIDONE TABLET FORMULATIONS USING IBUPROFEN SODIUM AS HYDROTROPIC SOLUBILIZING AGENT, Digest Journal of Nanomaterials and Biostructures, 2012; 2(4): 751 – 753
51. Deepak Nanda, Pankaj Nainwal, Amandeep Singh, D.A.Jain, REVIEW ON MIXED-SOLVENCY CONCEPT: A NOVEL CONCEPT OF SOLUBILIZATION, Deepak Nanda et al. ,Journal of Pharmacy Research, 2012; 3(2):411-413
52. Pankaj Nainwal, Amandeep Singh, Deepak Nanda, D.A.Jain, NEW QUANTITATIVE ESTIMATION OF ROSUVASTATIN BULK SAMPLE USING SODIUM BENZOATE AS HYDROTROPIC SOLUBILIZING AGENT, Journal of Pharmacy Research, 2012; 3(1): 6-8
53. Nainwal.P, Bhagla.A, Nanda.D, STUDY ON ANTIOXIDANT POTENTIAL AND WOUND HEALING ACTIVITY ON THE AQUEOUS EXTRACT OF FRUITS OF GARCINIA MANGOSTANA, IJPI's Journal of Pharmacognosy and Herbal Formulations, Volume-1
54. Pankaj Nainwal , Kapil Kalra , Deepak Nanda , Amandeep Singh, STUDY OF ANALGESIC AND ANTI-INFLAMMATORY ACTIVITIES OF THE ETHANOLIC EXTRACT ARIAL PARTS OF FUMARIA VAILLANTII LOISEL, Asian Journal of Pharmaceutical and Clinical Research, 2011; 4(1).
55. Amandeep Singh, Pankaj Nainwal , Deepak Nanda, D.A.Jain, SOLUBILITY ENHANCEMENT STUDY OF PIOGLITAZONE USING SOLID DISPERSION AS SOLUBILIZATION TECHNIQUE, International Journal of Science Innovations and Discoveries, Amandeep Singh et al., IJSID, 2011; 1(2): 95—100
56. Amandeep Singh, Pankaj Nainwal , Deepak Nanda, D. A. Jain, THE SOLUBILITY ENHANCEMENT STUDY OF PIOGLITAZONE USING DIFFERENT SOLUBLIZATION TECHNIQUIES, International Journal of Pharmacy & Pharmaceutical Sciences, 2012; 4(2).
57. Deepak Nanda, Pankaj Nainwal, Amandeep Singh, D.A.Jain, SOLUBILITY ENHANCEMENT STUDY OF DOMPERIDONE USING DIFFERENT SOLUBILIZATION TECHNIQUES, International Journal of Pharmacy and Pharmaceutical Sciences 2012; 2(3).
58. Pankaj Nainwal, Priyanka Sinha, Amandeep Singh, Deepak Nanda, D.A.Jain, A COMPARATIVE SOLUBILITY ENHANCEMENT STUDY OF ROSUVASTATIN USING SOLUBILIZATION TECHNIQUES, International Journal of Applied Biology & Pharmaceutical Technology, Oct - Dec -2011; 2(4).
59. Pankaj Nainwal , Deepak Nanda, Amandeep Singh, D. A. Jain, FORMULATION AND EVALUATION OF SOLID DISPERSION OF ROSUVASTATIN WITH VARIOUS CARRIERS ,Pharmacie Globale International Journal Of Comprehensive Pharmacy, Issn 0976-8157.
60. Pankaj Nainwal, Amandeep Singh1, Deepak Nanda, D.A.Jain, SOLUBILITY ENHANCEMENT OF AN ANTIHYPERLIPIDEMIC DRUG ROSUVASTATIN BY SOLID DISPERSION TECHNIQUE, International Journal of PharmTech Research IJPRIF ISSN : 0974-4304 , March-June 2012; 2: 3.
61. Kshitiz Agrawal, Pragati Bailwal, Amandeep Singh. Prem Saini, DEVELOPMENT OF QUALITY STANDARDS OF SUPRABHATAM CHURNA: A POLY HERBAL FORMULATION, International Journal of Pharmaceutical Research & Development,IJPRD, 2011; 4, June 2012.
62. Kapil Kalra, Amandeep Singh, Manisha Gaur, Ravindra P. Singh, and D. A. Jain, ENHANCEMENT OF BIOAVAILABLITY OF RIFAPENTINE BY SOLID DISPERSION TECHNIQUE , International Journal Of Pharmacy & Life Sciences, Kalra et al ., April, 2011; 2(4).

63. Pankaj nainwal ,Ranveer batsa, Amandeep singh, Deepak nanda, MEDICINAL PLANT STUDIES INFLUECED BY THE BIOTECHNOLOGICAL METHODS: A UPDATED REVIEW, International Journal of Pharma and Bio Sciences Apr-June-2011; 2(2).
64. Amandeep Singh, Sandhiya Pal, Prem Saini, IN- VITRO EVALUTION OF ANTI-INFLAMMATOTRY ACTIVITY OF TERMANALIA ARJUNA BARK EXTRACT, Journal of Innovative trends in Pharmaceutical Sciences,Vol-1(1): 9-12.
65. Amandeep Singh, Pramila Chauhan, Prem Saini, IN-VITRO ANTI-INFLAMMATORY EVALUTION OF HYDROALCOHALIC LEAVES EXTACT OF PINUS ROXBURGHII BY HRBC METHOD, International journal of Research in Pharmaceutical and Nano Sciences, 2013; 2(3): 268-271.
66. Amandeep Singh, Sumit Negi, Prem Saini, In Vitro Anti-Inflammatory Evaluation Of Leaves Using Hydroalcohalic Extract Of "Mangifera indica" International Journal of Pharmacy and Integrated Life Sciences, V1-(I7) PG (93-98).
67. Aman Deep Baghla, Kshitij Agarwal, Ramesh Verma and Deepak Nanda, Wound Healing Effect of the Aqueous Extract of the Leaves of Psidium guajava Linn., International Journal of chemicals and Life Sciences, 2013; 02 (03): 1104-1106.
68. Aman Deep Baghla, Kshitij Agarwal, Ramesh Verma and Deepak Nanda, WOUND HEALING EFFECT OF THE AQUEOUS EXTRACT OF THE LEAVES OF PSIDIUM GUAJAVA LINN., International Journal of chemicals and Life Sciences, 2013; 02(03): 1104-1106.
69. Bhupendra Kumar, Meenakshi Ghildiyal, Yogesh Tiwari , Deepika Chauhan, Amandeep Singh, IN-VITRO ANTI-INFLAMMATORY ACTIVITY OF GLYCINE MAX SEEDS ,Indo American Journal Of Pharmaceutical Sciences, 2018; 05(02): 868-871.
70. Piyali Dey, Jyoti Pandey, Bhupendra kumar, Amandeep Singh, IN VITRO ANTHELMINTIC ACTIVITY OF BARK EXTRACTS OF ARTOCARPUS HETEROPHYLLUS, International Journal of Pharmacy & Pharmaceutical Research, 2018; 03(11): 33-40.
71. Bhupendra Kumar, Yogesh Tiwari, Amandeep Singh, Vineet Kumar, IN VITRO ANTIUROLITHIC ACTIVITY OF FICUS PALMATA LEAVES, International Journal Of Pharmaceutical Technology And Biotechnology, 2019; 6(1): 01-09.
72. Md. Daneyal Khurshid, Vivek Shukla, Bhupendra Kumar and Amandeep A Review Paper on Medicinal Properties of Phyllanthus emblica , International Journal of Pharmacy and Biological Sciences, 2020; 10(3): 102-109.
73. Mr. Dwivedi Vishal, Mrs. Nisha A Bhatt, Dr. Amandeep Singh PREPARATION AND STANDARDIZATION OF NAVKARSHIKA CHURNA, World Journal Of Pharmacy And Pharmaceutical Sciences, 2020; 9(8).
74. Mitun Saha1, Mr. Bhupendra Kumar, Dr. Amandeep Singh Review Article on Various Phytochemicals and Different Medicinal Activities of Haritaki International Journal of Innovative Science and Research Technology, June 2020; 5(6).