WHITE PAPER

"Hemp/Cannabis Testing Standard and Genetic Classification: A Framework for Innovation, Regulation, and Economic Growth"

Executive Summary

The hemp and cannabis industry stands at a pivotal juncture. Amidst growing concerns about potential THC bans, the sector faces rising pressure to preserve regulatory clarity and market stability. In this evolving landscape, scientific rigor must align with regulatory frameworks to ensure sustainable growth. Central to this transformation is the application of standardized testing and genetic classification—tools that validate a plant's identity and therapeutic value through genomic analysis. These systems inform modern breeding, optimize cultivation, advance clinical research, and support sound policy-making. VpH, LLC, a subsidiary of Vyripharm Enterprises Inc., in partnership with the Original Breeders League (OBL), is leading the development of a unified quality control(QC) and quality assurance(QA) that include track, trace, compliance, unified method of testing and genetic classification framework. This white paper outlines the urgent need for such standards, the consequences of inaction, and the far-reaching benefits of an industry-wide shift toward scientific precision and regulatory cohesion.

Introduction

The rapid expansion of both industries has significantly outpaced the establishment of standardized protocols—particularly in areas of QC/QA and genomic classification. This lack of consistency complicates regulatory oversight, disrupts reproducibility in research, and introduces risks to patient safety due to inconsistent product profiles. In response, VpH and the Original Breeders League (OBL) have joined forces to pioneer a scientifically grounded framework for a unified method of hemp/cannabis testing and genetic taxonomy. Their initiative aims to bridge the gap between cutting-edge science and commercial application, providing a path toward regulatory compliance, product integrity, and treatment reliability.

The Imperative of a Unified Method of Testing and Genetic Classification for the Industry

The urgency of establishing a robust, standardized method of testing and genetic classification system cannot be overstated. As the global hemp/cannabis industry shifts from informal markets to tightly regulated medical and adult-use frameworks, the absence of consistent testing and genetic benchmarks hinders scientific progress,

undermines regulatory enforcement, and stifles economic scalability. Developing validated testing protocols and genomic standards is not merely an operational upgrade—it is a strategic necessity. A harmonized system ensures that every stakeholder—from cultivators and clinicians to regulators and patients—can operate with confidence, precision, and transparency in a rapidly evolving market *(MacCallum C et al., 2023; UNCTAD, 2022)*.

1. Enhancing Research and Development

A validated testing platform and genetic classification system acts as a molecular blueprint, unlocking the full treatment potential of the hemp/cannabis plant and their synthetic analogs through early-stage dosing evaluation and targeted innovation *(Mudge, Murch, & Brown, 2019; Slawek D, 2023)*. Without a universally accepted protocol, taxonomy, or genomic roadmap, hemp/cannabis remains a moving target for researchers and healthcare providers. For example, identical strain names can produce vastly different chemical profiles across regions or cultivators, resulting in inconsistent outcomes in clinical trials and preclinical research *(Hazekamp & Fischedick, 2012; Elzinga et al., 2015)*.

Standardized testing and genetic data enable scientists to:

- Identify and manipulate specific genes and alleles responsible for producing key cannabinoids and terpenes *(Vergara et al., 2021; Shujat, S , 2025).*
- Develop genetically stable cultivars with targeted treatment properties such as anti-inflammatory, anxiolytic, or neuroprotective effects *(Cristino L et al., 2020; Bolognini et al., 2013)*.
- Accelerate translational research, bridging laboratory discoveries with real-world clinical applications *(National Academies of Sciences, Engineering, and Medicine, 2017; NIH, 2023)*.

By genetically characterizing cultivars, R&D teams can consistently isolate and reproduce desirable traits, enhancing the reliability of research findings. This infrastructure also expands the evidence base needed for future FDA approvals, transforming anecdotal use into rigorously validated cannabinoid-based therapies *(FDA, 2024; MacCallum C et al., 2023)*.

2. Informing Regulatory Frameworks

For regulators, a unified method of testing and genetic classification offer a scientific foundation for evidence-based policymaking, rigorous compliance enforcement, and robust public safety standards. Currently, many regulatory frameworks rely heavily on THC/CBD content and chemical fingerprinting—tools that, while useful, are insufficient without insight into the plant's genetic makeup and validated testing methodology.

By integrating standardized genetic and a unified method of testing protocols, agencies can:

• Verify product consistency and authenticity, minimizing mislabeling and fraudulent claims *(Association of Public Health Laboratories, 2017)*.
• Detect and exclude genetically unstable cultivars or those containing harmful mutations or contaminants

(*USP-ASTM, 2023*).
• Establish enforceable definitions and certification standards for medical cannabis, recreational products, and hemp across jurisdictions (*FDA*, 2024).

Furthermore, classification systems support harmonization across state and international borders. A shared genetic taxonomy and testing protocol simplifies interstate commerce, aligns global standards, and strengthens trade negotiations between countries seeking to regulate or import cannabinoid-based products responsibly. Such harmonization not only ensures safer consumer outcomes but also accelerates the development of a lawful and scalable international cannabis marketplace.

3. Improving Patient Outcomes

The promise of medical cannabis lies in its potential to deliver individualized treatment outcomes—but this potential can only be realized through precision. In the absence of validated testing and genetic classification, patients often consume products with inconsistent effects due to batch variability and undefined chemical *profiles (Slawek D, 2023; Mudge, Murch, & Brown, 2019)*.

With a robust testing and classification system in place:

• Patients gain access to strain-specific treatments supported by data on cannabinoid and terpene composition *(Krill C, 2020; Elzinga, Fischedick, Podkolinski, & Raber, 2015)*.
• Clinicians can confidently recommend cultivars that align with known therapeutic responses for specific conditions *(Bolognini et al., 2013)*.
• Pharmacovigilance becomes actionable, enabling post-market tracking of side effects and outcomes linked to defined chemotypes and genotypes *(Fischedick, 2017; National Academies of Sciences, Engineering, and Medicine, 2017)*.

Ultimately, testing and genetic standardization transforms cannabis from a subjective remedy to a reliable, personalized medicine—an essential evolution for patients with chronic pain, PTSD, epilepsy, cancer-related symptoms, and other complex conditions *(National Institutes of Health, 2023; Backer et al., 2020)*.

4. Economic Advantages

Beyond its health and regulatory implications, a unified method of testing and genetic classification delivers significant economic value to industry stakeholders and governments. The current absence of consistent strain identification and genetic stability undermines consumer trust, weakens supply chain efficiency, and complicates product differentiation *(Hunt D, 2020; Cornell University, 2020)*.

Implementing standardized testing protocols and genetic classification systems can:

• Elevate brand reputation and consumer trust by offering transparency and traceability *(Original Breeders League, 2024; Agoncillo & Sadegi, n.d.)*.
• Enable intellectual property protections, allowing cultivators and breeders to patent or license unique genetic cultivars *(Canadian Science Publishing, 2022; Wyse, J et al., 2021)*.

• Improve international market access by aligning with EU and UN phytopharmaceutical export standards *(United Nations Office on Drugs and Crime, 2022)*.
• Strengthen investor confidence, as reliable, standardized products reduce risk and enhance scalability *(Deloitte Canada, 2020; National Cannabis Industry Association, 2022)*.

For licensed operators, this translates into enhanced market competitiveness and revenue potential—domestically and abroad. For governments, it means stronger regulatory enforcement, reduced black-market activity, and a broader taxable base, fueling job creation, tax revenue growth, and long-term economic development *(U.S. Bureau of Labor Statistics, 2023; Cannabis Business Times, 2024; Vyripharm Enterprises Inc., 2024)*.

Challenges in the Absence of Standardization

Both industries face a critical inflection point—intensified by the growing momentum behind potential THC bans—yet one of its most persistent vulnerabilities remains the absence of a unified scientific standard. Unlike agriculture, pharmaceuticals, and biotechnology—sectors that rely on rigorous testing and genomic frameworks—cannabis continues to operate without foundational consistency *(Slawek D, 2022; Dodson, L, 2025)*. This lag is rooted in historical stigma, fragmented regulation, and the delayed integration of standardized testing and genomic classification tools *(Association of Public Health Laboratories, 2017; U.S. Food and Drug Administration, 2024)*. The absence of clear, validated frameworks presents profound challenges that ripple through the entire value chain—from seed to sale, and from clinical research to regulatory oversight *(Backer et al., 2020; Mudge et al., 2021)*.

1. Inconsistent Product Quality

One of the most immediate and visible consequences of lacking standardized testing and genetic classification system is inconsistent product quality. Consumers often report notable differences in the effects of cannabis products sold under the same strain name—differences that stem from genetic ambiguity and insufficient analytical controls *(Hazekamp & Fischedick, 2012; Fischedick, 2017)*. This variability is not merely anecdotal; it is scientifically validated, often arising from poor genotype-environment control and inconsistent strain labeling *(Cornell University, 2020; Canadian Science Publishing, 2022)*.

Without establishing true unified method of testing and genetic benchmarks, the following occurs:

• Cultivars are routinely misidentified or mislabeled, resulting in widely variable cannabinoid and terpene *compositions (Elzinga et al., 2015; Wyse, J et al., 2021)*.
• Therapeutic (Treatment) outcomes become unpredictable, undermining patient and consumer confidence *(Brusa P et al., 2022)*.
• Brands face challenges maintaining credibility, as consistent, high-quality experiences become rare *(Hunt D, 2020; Original Breeders League, 2024)*.

In regulated markets, such variability erodes trust in hemp and cannabis as both a treatment product and a commercial commodity *(Solink, 2023)*. Standardization is the only pathway to ensuring product reliability across growing conditions, processing methods, and supply chains *(Agoncillo & Sadegi, n.d.; Vyripharm Enterprises Inc., 2024)*.

2. Regulatory Ambiguity

The regulatory implications of a unified method of testing and genetic ambiguity are far-reaching. In jurisdictions where hemp and cannabis are legal for medical or adult use, regulators are expected to monitor quality, enforce compliance, and uphold safety. However, without standardized testing protocols and genomic data, these responsibilities are undermined from the outset *(Dodson, L, 2025; U.S. Food and Drug Administration, 2024)*.

The absence of genetic and unified testing standards leads to:

- Difficulty defining product classes—particularly in distinguishing hemp from cannabis using THC thresholds alone, an unreliable method without genomic validation *(Cornell University, 2020; Canadian Science Publishing, 2022)*.
- Ambiguity in licensing frameworks, where producers must operate under vague or contradictory regulatory categories *(U.S. Pharmacopeial Convention, 2023)*.
- Increased legal disputes as interpretations of compliance vary across jurisdictions *(Solink, 2023)*.
- Delays in policy harmonization, both across U.S. states and in global regulatory agreements, due to the lack of shared scientific benchmarks *(United Nations Office on Drugs and Crime, 2022)*.

A validated testing and genetic classification system offers regulators a science-backed, objective mechanism to guide enforcement, protect public health, and stabilize the cannabis economy *(U.S. Food and Drug Administration, 2024; U.S. Pharmacopeial Convention, 2023)*.

3. Impediments to Research

Scientific research thrives on reproducibility. Yet hemp and cannabis studies remain hampered by the lack of standardized plant materials and validated testing methodologies. Without genetic clarity, researchers struggle to replicate findings, leading to inconsistent outcomes and uncertainty over which cultivars yield therapeutic *(Quiroz H et al., 2002; Brusa P et al., 2022; Backer et al., 2020)*.

As a result:

- Research institutions are forced to create proprietary reference libraries, driving up costs and slowing progress *(Original Breeders League, 2024)*.
- Clinical trials risk invalidation due to genetically inconsistent inputs and compromised data integrity *(Slawek D , 2022)*.
- Advances in pharmacogenetics and personalized medicine are delayed, blocking integration of cannabinoid therapies into mainstream care *(National Academies of Sciences, Engineering, and Medicine, 2017)*.

Compounding these issues, academic and federal researchers often face barriers to accessing diverse, verified hemp/cannabis

materials due to regulatory restrictions and the absence of national testing and genomic databases *(National Institutes of Health, 2023; U.S. National Institute of Standards and Technology, 2024)*. Standardization is not just beneficial—it is critical to democratize cannabis research and fuel innovation across academia, clinical practice, and commercial development.

4. Market Inefficiencies

The lack of a unified method of testing and genetic standardization system, continues to undermine the growth and maturity of the hemp/cannabis industry as a globally scalable commercial sector. These inefficiencies restrict innovation, discourage investment, and elevate risks throughout the supply chain *(Hunt D, 2020; National Cannabis Industry Association, 2022)*.

Market fragmentation manifests in several critical ways:

- Barriers to entry for small cultivators, who often lack access to validated testing tools or certified genetics—and are disadvantaged by mislabeled competitors *(Agoncillo & Sadegi, n.d.; Vyripharm Enterprises Inc., 2024)*.
- Supply chain inconsistencies, where variable raw material quality disrupts production, compliance, and consumer *trust (Shujat, S , 2024)*.
- Limited scalability, as multinational operators hesitate to invest in jurisdictions with unclear quality frameworks or unreliable genetics *(Reuters, 2024; Pacula, 2023)*.
- Missed trade opportunities, since most countries cannot accept or export hemp/cannabis products without harmonized testing protocols and genetic lexicons *(Deloitte Canada, 2020; United Nations Office on Drugs and Crime, 2022)*.

Other sectors—such as wine, coffee, and specialty agriculture—have long relied on testing and genetic traceability to create recognized global standards *(MDPI, 2020; Farmonaut, 2023)*. Cannabis, with its immense medical, industrial, and economic promise, must follow a similar path to achieve global legitimacy and sustainable scale.

VpH and OBL: Pioneers in Standardized Testing and Genetic Classification

The collaboration between VpH, LLC and the Original Breeders League (OBL) stands out as a beacon of scientific credibility, regulatory foresight, and practical application. These two organizations, each a leader in its respective domain, have combined their strengths to tackle one of the most critical challenges facing the hemp/cannabis sector today: the need for a standardized, validated, and globally adoptable testing and genetic classification framework *(Original Breeders League, 2024; Watts & Wiggins, 2024; Vyripharm Enterprises Inc., 2024)*.

VpH brings a deep foundation in biotechnology, regulatory compliance, and platform development—working at the intersection of science and policy to support innovation in healthcare and agriculture. As a subsidiary of Vyripharm Enterprises Inc., VpH is recognized for creating translational solutions that bridge clinical need and government standards *(Vyripharm Enterprises Inc., 2024; Dodson, L, 2025)*.

Meanwhile, OBL contributes decades of expertise in cannabis breeding, germplasm preservation, and trait stabilization. Their commitment to genetic integrity and breeder rights makes them a vital partner in ensuring that the classification system respects and protects legacy genetics while enabling scientific advancement *(Agoncillo & Sadegi, n.d.; Canadian Science Publishing, 2022)*.

Together, VpH and OBL are establishing a unified pathway for the industry—one that aligns with scientific rigor, regulatory expectations, and the diverse realities of cultivators and product developers worldwide *(U.S. Pharmacopeial Convention, 2023; U.S. Food and Drug Administration, 2024)*.

VpH, LLC – A Scientific and Regulatory Bridge

VpH, a subsidiary of Vyripharm Enterprises Inc., is at the forefront of biotechnology innovation, with a mission to advance regulatory science in the hemp/cannabis sector. Its strength lies in integrating complex genomic science into actionable regulatory tools—such as validated testing methods and classification protocols—that are essential in an industry grappling with inconsistent standards, evolving laws, and growing public health expectations *(National Institutes of Health, 2023)*.

VpH's multidisciplinary expertise spans:

- Genomics and molecular diagnostics, applying advanced sequencing to precisely characterize cannabis strains at the DNA level *(Backer et al., 2020; Wyse, J et al., 2021)*.
- Data governance and compliance design, ensuring scientific data is regulatory-grade, securely managed, and aligned with government reporting needs *(U.S. Pharmacopeial Convention, 2023; Vyripharm Enterprises Inc., 2024)*.
- Technology platform development, building scalable tools for strain authentication, regulatory testing, and compliance automation *(Shujat, S , 2024)*.

With deep experience in both scientific research and legislative policy, VpH plays a vital role in translating genetic and testing data into actionable standards. This enables seamless integration into federal, state, and commercial frameworks—ensuring that science leads policy, and not the other way around *(National Academies of Sciences, Engineering, and Medicine, 2017)*.

Original Breeders League (OBL) – Guardians of Genetic Integrity

The Original Breeders League (OBL) brings decades of experience in cannabis cultivation, breeding, and genetic preservation. As stewards of some of the most diverse and historically significant cannabis lineages, OBL is committed to preserving genetic diversity in the face of increasing commercial homogenization *(Hunt D, 2020; Fischedick, 2017)*.

OBL's contributions are pivotal in:

- Archiving and preserving heritage strains that serve as reference points for genomics and evolutionary research *(Hazekamp & Fischedick, 2012; Original Breeders League, 2024)*.
- Promoting sustainable cultivation practices that link genotype to outcomes like disease resistance and yield stability *(Caplan et al., 2018;*

Elzinga et al., 2015).
• Protecting breeder IP through genetic fingerprinting—critical for asserting legal ownership and enabling royalty-based licensing *(Vergara et al., 2021; Canadian Science Publishing, 2022)*.

This blend of living genetic resources and principled stewardship positions OBL as a foundational partner in bringing scientific clarity to an otherwise fragmented and inconsistent marketplace *(Agoncillo & Sadegi, n.d.; Watts & Wiggins, 2024)*.

A Transformational Partnership

Together, **VpH and OBL are developing a comprehensive, end-to-end ecosystem for standardized testing, genetic classification, and regulatory compliance** across the hemp and cannabis value chain. This unified platform empowers stakeholders—from legacy cultivators to pharmaceutical developers—to operate on a **shared scientific and policy-aligned foundation** *(Watts & Wiggins, 2024; Original Breeders League, 2024; Vyripharm Enterprises Inc., 2024)*. Their collaboration rests on three integrated pillars, each addressing a critical need in today's fragmented cannabis marketplace:

1. Genomic Sequencing

Utilizing **high-throughput sequencing and advanced genotyping platforms**, VpH and OBL are constructing robust genomic maps of cannabis cultivars *(Backer et al., 2020; Quiroz H et al., 2002; Wyse, J et al., 2021)*. These genomic profiles act as **molecular barcodes**, providing a powerful means of distinguishing strains based on genetic identity, rather than phenotype alone. This approach is vital for:

- Eliminating fraudulent labeling and unverified strain claims *(Hazekamp & Fischedick, 2012; Mudge et al., 2021)*.
- Protecting intellectual property rights for breeders and innovators *(Canadian Science Publishing, 2022; Vergara et al., 2021)*.
- Enhancing traceability and repeatability in both medical and commercial contexts *(Elzinga et al., 2015; Slawek D, 2022)*.

Genomic sequencing, when applied across the supply chain, introduces scientific rigor and traceability—foundations necessary for building trust among regulators, consumers, and investors alike *(Krill C, 2020; Caplan et al., 2018)*.

2. Data Integration

A central feature of the partnership is the creation of a **data infrastructure that links standardized testing outputs and genetic data** with phenotypic traits, chemotype profiles, and known therapeutic applications *(Fischedick, 2017; Brusa P et al., 2022)*. This integrated informatics environment allows for:

- Predictive modeling of strain behavior in clinical or cultivation settings *(National Academies of Sciences, Engineering, and Medicine, 2017; Shujat, S , 2024)*.
- Matching genetics to specific medical indications *(Cristino L et al., 2020; Bolognini et al., 2013)*.

- Identification of novel cannabinoid and terpene combinations for targeted drug development *(Krill C, 2020; Elzinga et al., 2015)*.

By applying **AI-powered analytics and machine learning**, this platform will continuously learn and evolve, enabling increasingly accurate predictions for efficacy, safety, and market demand *(Original Breeders League, 2024; Vyripharm Enterprises Inc., 2024)*. Over time, this smart system will enhance therapeutic matching and support drug discovery pipelines with real-world cannabis data *(NIH, 2023)*.

3. Standard Development

At the core of this initiative is the establishment of **science-based standards and regulatory templates** that can be readily adopted by laboratories, producers, and oversight agencies *(U.S. Pharmacopeial Convention, 2023; FDA, 2024)*. These standards include:

- **Genetic nomenclature protocols** for harmonizing strain naming conventions globally *(Mudge et al., 2021; Hazekamp & Fischedick, 2012)*.
- **Testing methodology benchmarks** that enable consistent results across labs and regions *(Association of Public Health Laboratories, 2017; Dodson, L, 2025)*..
- **Policy-aligned compliance templates** to streamline approval processes at state, federal, and international levels *(Slawek D, 2022; Hunt D, 2020)*.

By aligning with **FDA, USDA, DEA, USP, and international trade protocols**, these standards position the industry for **interstate commerce, global trade participation**, and integration with pharmaceutical and agricultural supply chains *(U.S. Pharmacopeial Convention, 2023; Reuters, 2024; UNODC, 2022)*.

In essence, the VpH–OBL alliance sets a new gold standard in hemp/cannabis testing and genetic classification system—one that unites rigorous science with respect for the plant's cultural and biological legacy *(Agoncillo & Sadegi, n.d.; Canadian Science Publishing, 2022)*. This partnership is not just solving today's regulatory and scientific gaps; it is laying the foundation for a globally compliant, innovation-ready infrastructure. By establishing the tools and standards for consistency, safety, and economic scalability, the VpH–OBL model paves the way for a smarter, safer, and more economically resilient hemp/cannabis *industry (Vyripharm Enterprises Inc., 2024; Solink, 2023; Cannabis Business Times, 2024)*.

Strategic Benefits of Standardization

The industry's transition into a globally recognized and scientifically validated sector hinges on two foundational pillars: standardized testing and genetic classification. While market demand continues to grow, the looming threat of a THC ban casts uncertainty over both the medical and adult-use sectors *(Solink , 2023; World Health Organization, 2025)*. In this evolving landscape, stakeholders must understand that the long-term viability, scalability, and global competitiveness of hemp/cannabis rely on the adoption of a

shared scientific language. A robust, validated classification system unlocks a spectrum of strategic advantages—ranging from regulatory compliance and research acceleration to economic scalability and patient safety—that collectively elevate cannabis from a fragmented commodity to a precision-aligned therapeutic tool within modern healthcare systems *(Dodson, L, 2025; Mudge, Murch, & Brown, 2019)*.

1. Regulatory Alignment

A mature and scalable industry depends on a strong regulatory backbone. In the hemp/cannabis sector, standardized testing and genetic classification provide the essential scaffolding for consistent, science-based policy development *(U.S. Pharmacopeial Convention, 2023; U.S. Food and Drug Administration, 2024)*. The current legal patchwork—ranging by state, country, and municipality—creates a landscape riddled with confusion, inefficiency, and compliance risk. Heightened by renewed discussions of banning THC outright, the urgency for coherent regulatory alignment has never been greater *(Reuters, 2024).*

By implementing standardized testing protocols and validated genetic benchmarks:

- Regulators can objectively define cannabis and hemp using genomic data, eliminating the ambiguity surrounding THC thresholds and phenotypic claims *(Cornell University, 2020; Canadian Science Publishing, 2022)*.
- State, federal, and international agencies can coordinate definitions, facilitating cross-border trade and policy harmonization *(UNODC, 2022)*.
- Businesses gain operational clarity, reducing the likelihood of product recalls, regulatory penalties, and litigation *(FDA, 2024)*.
- Enforcement agencies benefit from defensible, data-backed oversight mechanisms that stand up to scientific and legal scrutiny *(U.S. Pharmacopeial Convention, 2023)*.

In aligning science with law, standardization minimizes friction in the supply chain and elevates regulatory integrity—laying the foundation for a truly global, stable, and compliant cannabis industry *(Dodson, L, 2025; Original Breeders League, 2024)*.

2. Enhanced Research Capabilities

In the scientific realm, standardized testing methodology and genetic classification serve as a gateway to meaningful discovery. Historically, hemp/cannabis research has been hindered by inconsistent plant material, lack of reproducible results, and regulatory bottlenecks *(National Academies of Sciences, Engineering, and Medicine, 2017)*. These challenges have stifled progress in both basic and clinical research. The introduction of a validated testing method and genetic taxonomy empowers researchers to isolate variables, replicate studies across institutions, and dramatically accelerate innovation across the life sciences *(Backer et al., 2020; Quiroz H et al., 2002)*.

Standardization enables:

- A unified reference library of cannabis genotypes, streamlining comparative research and reducing experimental redundancy *(Slawek D, 2022)*.
- Strain-specific clinical investigations, where therapeutic outcomes can be definitively

correlated to genetic traits rather than generalized chemical fingerprints.
• Targeted drug development based on genetically stable cultivars, opening new pathways for treating epilepsy, chronic pain, inflammation, and anxiety *(Bolognini et al., 2013; Cristino L et al., 2020)*.
• Cross-institutional data interoperability, enabling collaboration between academic labs, biotech startups, government regulators, and pharmaceutical developers *(NIH, 2023; Simei J et al., 2024)*.

A scientifically grounded testing and genetic system increases the credibility and funding potential of cannabis research—drawing in world-class institutions and de-risking participation from cautious pharmaceutical partners. With rigor and structure in place, cannabis can fully integrate into the ecosystem of modern precision medicine *(Backer et al., 2020; National Academies, 2017)*.

3. Market Expansion

The global hemp/cannabis market is projected to exceed $100 billion within the next decade *(Cannabis Business Times, 2024)*. However, this growth is threatened by increasing regulatory pressure—including the looming possibility of a THC ban—and eroding confidence among policymakers *(Solink, 2023; Reuters, 2024)*. These trends expose a critical gap: the absence of standardized testing and genetic classification that can validate the industry's scientific and operational maturity *(Dodson, L, 2025; U.S. Pharmacopeial Convention, 2023)*.

Standardization is the catalyst for regaining trust, unlocking investment, and positioning hemp/cannabis as a policy-aligned engine of economic growth. By implementing unified frameworks, the industry can restore its trajectory toward scalable, compliant, and export-ready expansion *(Original Breeders League, 2024; Canadian Science Publishing, 2022)*.

The economic benefits include:

• Smooth entry into pharmaceutical and nutraceutical markets, where validated genetics and quality assurance are required for certification and reimbursement *(Caplan, Dixon, & Zheng, 2018; Brusa P et al., 2022)*.
• Expanded global trade, as governments increasingly demand traceability and verified input standards *(United Nations Office on Drugs and Crime, 2022)*.
• Enhanced investor confidence, as standardization reduces risk from recalls, compliance failures, and brand dilution *(Deloitte Canada, 2020; National Cannabis Industry Association, 2022)*.
• Intellectual property enforcement, empowering cultivators and breeders to patent proprietary strains and product lines *(Fischedick, 2017)*.

For governments, standardization enhances the long-term fiscal and social sustainability of legalization policies—yielding increased tax revenues, expanded employment, and scientific legitimacy *(U.S. Bureau of Labor Statistics, 2023; Vyripharm Enterprises Inc., 2024)*. It lays the foundation for large-scale operations that meet both domestic demand and international compliance.

4. Public Health Protection

Perhaps the most essential benefit of standardization is the protection of public health. In a market where consumers rely on hemp/cannabis for managing chronic pain, cancer-related symptoms, seizure disorders, and mental health conditions, product safety and consistency are non-negotiable *(Bolognini et al., 2013)*. The absence of a validated testing method and genetic standard has led to mislabeling, adulteration, and misidentification of cultivars—issues that not only erode consumer trust but also pose significant health risks *(Hazekamp & Fischedick, 2012; Elzinga et al., 2015)*.

Through standardized testing and genetic classification:

- Patients and consumers receive accurate, consistent labeling, minimizing the risk of adverse reactions or therapeutic failure *(Mudge, Murch, & Brown, 2019; Slawek D, 2022)*.
- Contaminant screening becomes genotype-aware, enabling more targeted identification of cultivars prone to mold, pesticide uptake, or heavy metal absorption *(Shujat, S , 2024; Association of Public Health Laboratories [APHL], 2017)*.
- Pharmacovigilance systems gain power, with the ability to trace side effects and therapeutic outcomes back to specific genotypes and chemical profiles *(National Academies of Sciences, Engineering, and Medicine, 2017; National Institutes of Health, 2023)*.
- At-risk populations, such as children, the elderly, and those with complex medical needs, benefit from more predictable dosing and reliable treatment efficacy *(U.S. Food and Drug Administration [FDA], 2024; Pharmacy Times, 2023)*.

By embedding scientific rigor into the foundation of product development, labeling, and prescribing, testing and genetic standardization ensures that public health is safeguarded and elevated—positioning hemp/cannabis as a credible, accountable component of modern medicine.

Economic Implications

The standardization of a unified testing method and genetic classification system in both the hemp and cannabis industries offers more than scientific and regulatory benefits—it is a powerful economic driver that propels growth for both private industry and public institutions. By establishing consistent, validated testing methodologies and genetic benchmarks, the industry becomes more stable, investable, and globally competitive *(Deloitte Canada, 2020; U.S. Pharmacopeial Convention, 2023; UNCTAD, 2022; Jikomes & Zoorob, 2018)*. For cultivators, manufacturers, and service providers, standardization improves product reliability, reduces operational risks, and opens new market segments—including pharmaceutical, nutraceutical, and export channels *(Caplan, Dixon, & Zheng, 2018; Canadian Science Publishing, 2022)*. For governments, it builds a dependable fiscal platform that supports public services—such as infrastructure, healthcare, and education—through increased tax revenues, licensing fees, and formal job creation *(National Cannabis Industry Association, 2022; Vyripharm Enterprises Inc., 2024)*. In a sector projected to exceed $100 billion globally by the next decade (*Grand View Research, 2024)*, standardization ensures that this growth is not only scalable but

sustainable *(Cannabis Business Times, 2024)*.

For Licensed Participants

• Increased Revenue

Testing and genetic standardization significantly expand market potential by opening access to previously cautious sectors—such as pharmaceuticals, nutraceuticals, and wellness. With validated testing protocols and genetically verified inputs, companies gain consumer trust, which drives brand loyalty, supports premium pricing, and stabilizes revenue *(Krill C, 2020; Fischedick, 2017)*.

Standardization further enables:

- Entry into high-barrier export markets requiring traceability and authentication *(United Nations Office on Drugs and Crime, 2022)*.
- Differentiation through genetically certified strains linked to specific therapeutic claims.
- Monetization of intellectual property, where verified cultivars become legally protected and licensable assets *(Hazekamp & Fischedick, 2012)*.

Companies that integrate testing and genetic compliance position themselves as credible partners for healthcare providers, payors, and international supply chains.

• Operational Efficiency
Validated testing protocols and uniform genetics streamline cultivation and manufacturing processes by minimizing phenotypic variability. This enables:

- Predictable yield performance and input planning *(Mudge, Murch, & Brown, 2019)*.
- Reduced costs associated with redundant quality control testing, recalls, and regulatory missteps *(Slawek D, 2022)*.
- Deployment of advanced technologies such as AI-driven crop management, digital compliance reporting, and automated phenotyping *(Shujat, S , 2024)*.

The result is a leaner, more agile operational model that supports scalability and quality assurance at every step of the supply chain.

For Governments

• Tax Revenue Growth
Governments benefit directly from industry expansion fueled by trust and regulatory clarity. Standardization ensures product safety and reliability, which accelerates consumer adoption and reduces reliance on illicit markets. This, in turn, drives taxable revenue across multiple channels:

- Retail and excise taxes on legal cannabis products.
- Corporate taxes on licensed producers.
- Licensing and regulatory fees *(U.S. Bureau of Labor Statistics, 2023)*.

Additionally, jurisdictions that adopt robust regulatory standards may become innovation hubs, attracting R&D investment and fostering sector growth in biotechnology, agriculture, and compliance technology *(National Institutes of Health, 2023)*.

• Job Creation
A standardized industry is a scalable one—

and scalability is the engine of employment growth. Standardization supports:

- Expansion of companies across cultivation, testing, manufacturing, retail, logistics, and marketing *(U.S. Food and Drug Administration, 2024)*.
- Workforce development in STEM fields like genomics, data science, agronomy, and regulatory law (Pharmacy Times, 2024).
- Economic inclusion by providing skilled career pathways in underserved communities.

Importantly, the threat of a federal or state-level THC ban could stall this momentum *(Solink, 2023)*. But by adopting scientific frameworks and aligning industry standards, governments can ensure that the cannabis sector reaches its economic potential and fulfills its public health promise.

Conclusion

The establishment of a standardized hemp/cannabis genetic classification system is not merely a scientific milestone—it is a strategic, regulatory, and economic necessity *(Vergara et al., 2021; Jikomes & Zoorob, 2018)*. As the hemp/cannabis industry transitions from fragmented practice to institutional legitimacy, its long-term success depends on the ability to ensure consistency, transparency, and credibility across every stage of the value chain *(MacCallum C et al., 2023)*. From cultivation and labeling to patient care and international trade, testing and genetic standardization serve as the structural backbone of a modern, trustworthy, and globally competitive hemp/cannabis ecosystem *(MacCallum C et al., 2023)*.

VpH, a subsidiary of Vyripharm Enterprises Inc., in strategic partnership with the Original Breeders League (OBL), is uniquely positioned to lead this transformation. Through their integrated framework—rooted in a standardized testing methodology, genetic fidelity, data science, and cross-jurisdictional policy alignment—VpH and OBL are setting a precedent for quality control, clinical integration, and international compliance *(Business Center, 2024; Vaillencourt et al., 2025)*. Their work provides a scalable model that addresses both current regulatory challenges and future opportunities in precision medicine and global commerce *(UNCTAD, 2022; Grand View Research, 2024)*.

For researchers, a standardized approach unlocks reproducibility and accelerates the development of targeted therapies. For regulators, it offers enforceable definitions and data-backed compliance structures *(UNCTAD, 2022)*. For licensed operators, it increases efficiency, protects intellectual property, and facilitates access to new markets *(Crossney J, 2021; Grand View Research, 2024)*. For governments, it establishes a tax-generating, job-creating, and innovation-driven framework with clear public health and economic returns *(NCSL, 2024)*.

Most importantly, the greatest beneficiary is the consumer—patients and adult-use users alike—who will gain access to reliable, effective, and safe products supported by rigorous science and sound regulation *(Vergara et al., 2021; Jikomes & Zoorob, 2018; Crossney J, 2021)*. In the face of emerging challenges—such as renewed discussions around THC bans and product mislabeling—the adoption of a comprehensive hemp/cannabis testing and genetic classification standard is no longer

optional. It is the key to safeguarding the industry's future.

Now is the time for stakeholders across science, business, and policy to rally behind a unified vision. The framework developed by VpH and OBL is not only actionable—it is essential. It represents the convergence of science and society, regulation and innovation, tradition and transformation. By championing this approach, we can shape a safer, smarter, and more sustainable future for hemp and cannabis worldwide.

Call to Action

Call to Action – Enhanced Version

The time to act is now. As policymakers accelerate efforts to restrict or ban THC, the potential consequences for the entire hemp/cannabis ecosystem are profound. Without a standardized, unified method of testing and a genetic classification framework, the industry remains vulnerable—scientifically fragmented, legally ambiguous, and economically unstable. To safeguard its future, the global hemp/cannabis sector must evolve from reactive uncertainty to proactive standardization *(UNCTAD, 2022)*.

We urge key stakeholders to step forward with intention:

Policymakers must integrate validated testing standards and genetic classification into regulatory frameworks. Doing so will enhance consumer protection, reduce enforcement ambiguities, and restore scientific legitimacy to public policy *(UNCTAD, 2022)*. A unified system also offers a compelling rationale to revisit the THC ban with nuance—distinguishing between risk and therapeutic potential based on genetic and chemical evidence *(MacCallum C et al., 2023; Crossney J, 2021)*.

Industry Leaders are called to adopt the VpH and OBL framework into their operational infrastructure. Standardized testing protocols and verified genetic identifiers will enable producers, processors, and distributors to improve product consistency, reduce risk, and open doors to international markets *(Grand View Research, 2024; Vaillencourt et al., 2025)*. Quality assurance becomes a competitive advantage—not just a regulatory checkbox.

Research Institutions and Academia are invited to validate, enhance, and expand the current framework through rigorous, interdisciplinary collaboration. With a standardized genetic and testing foundation, reproducibility improves, translational research accelerates, and novel therapies move from bench to bedside with greater precision and confidence *(Jikomes & Zoorob, 2018)*.

VpH, in collaboration with the Original Breeders League (OBL), has built a comprehensive, science-backed, and scalable model that bridges cultivation, medicine, and policy. Their system protects genetic heritage, elevates quality standards, and positions the industry for global leadership in precision agriculture, biotechnology, and integrative healthcare *(Business Center, 2024)*.

We call on all stakeholders to rally behind this urgent initiative—unify under a shared scientific standard for hemp/cannabis testing and genetic classification. This is not just a technical upgrade; it is a moral, economic, and public health imperative.

The tools are ready. The foundation has been laid. The leadership is present. What's needed now is commitment and courage to act.

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