

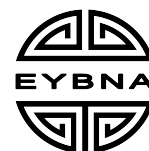
In partnership with:

Seach*
MEDICAL GROUP



Case Study

Understanding the
terpenes behind
"Daytime" and
"Nighttime"
cannabis strains



Background

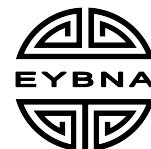
The ability to match a cannabis chemovar to a specific medical indication will enable decreasing the trial and error period that many medical cannabis patients go through. Collecting data on the medical cannabis usage in patients, allows the potential identification of the major therapeutically potent compounds in cannabis strains. Eybna's ethnobotanical study is a collaborative project between Eybna Technologies and Seach Medical Group that started in 2015 to identify the common terpenes found in effective pharmacological strains. The first focus was looking into the known daytime "Sativa-like" effect and nighttime "Indica-like" effect.

About Eybna

The vision of Eybna Technologies, founded in 2014 in Israel, is to cultivate an understanding of the chemotypic entities of cannabis and their effects on humans, bringing us one step closer to developing personalized natural cannabis medicine and making cannabis treatment accessible to more people worldwide.

About Seach Medical Group

Established by a third generation of Israeli horticulture innovators and farming experts, Seach has been supplying high quality medical cannabis flowers and products to leading pharmaceutical brands, as well as thousands of patients and pharmacies since 2008. Seach operates over 14,000 Sq. meters of fully automated, climate-controlled breeding and cultivation facilities, including R&D labs and an extensive cannabis genetics bank.



Medical Cannabis In Israel - A Fruitful Ground for Data Collection

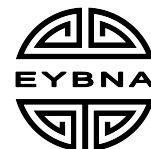
In Israel, cannabis for adult use is still prohibited, but cannabis for medical is legal since 2008. The Israeli Medical Cannabis program is controlled and regulated by the Israeli Ministry Of Health.

Patients are subscribed to one medical cannabis supplier that provides the patient's prescribed cannabis exclusively and consistently every 30 days. Patients are free to choose the cannabis products and strains from the offered variety and can change their selection each month. Naturally, most patients start experimenting with a wide variety of strains in their first 2-3 months of treatment, which tends to narrow down with time, to 1-2 strains, as they learn which strains work best for them.

Long-term data collection on patients' medical indication, preferred strains, and monthly consumed quantity becomes an extremely valuable database with great potential to learn on strains' medical values.

Objectives

The primary goal is to determine the phytochemical components responsible for the daytime "Sativa-like" effect and nighttime "Indica-like" effects of cannabis as reported from therapeutic human consumption. The secondary goal is to **translate the findings into innovative solutions and formulations for more targeted cannabis products.**



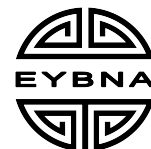
Methods

1 Study Cohort

Data from patients was collected over the span of 6 years. Gender, age, medical indication and most used strains were collected. Age ranged from 20 - 95 years, where the biggest age group was between 21 - 45 years. Personal patients details kept anonymous.

2 Patient Data Gather

A survey was performed by Seach, a licensed producer of medical cannabis in Israel, and was conducted by phone, in person or through an online survey application. The survey contained questions which included participants' health conditions (e.g., diverse medical history and diagnosis), use patterns of medical cannabis, perceived effectiveness of cannabis at alleviating or managing their symptoms, and cannabis strain preference for treatment during the day or night time. Informed consent was obtained from survey participants. Access to the survey was restricted to one use only to avoid duplication of survey results. Participants rated strains as most effective or least effective for treatment of their indication, followed by rating the degree of daytime or nighttime effectiveness on a Likert Scale of 10. Inclusion criteria included only registered Seach patients who ordered dried cannabis flowers/strains from Seach and were diagnosed with one or more health conditions by a certified healthcare professional. Flowers were consumed via inhalation by either smoking/vaping whole flower.



3 Chemovar Collection

Cannabis plant material was supplied from Seach. 8 chemovars of *C. sativa* flower were soil-grown in a 19-wk cycle, harvested after 8 - 9 wk of flowering, and cured to 10 - 12% moisture content. The following information on each chemovar was obtained: known genetics, botanical structure description, ground and climate conditions, period from seeding to harvesting, drying & curing processes, documentary photography of the structure of the flower, leaf and plant. In order to reduce measurement errors that may occur due to different growing conditions of the flowers, each chemovar sample was composed from a mixture of 20 grams dried and cured cannabis flowers, collected from different parts of the plant and from various plants of the same strain. The chemovar samples were sent to the Hebrew University for chemical analysis.

4 Chemical Analysis

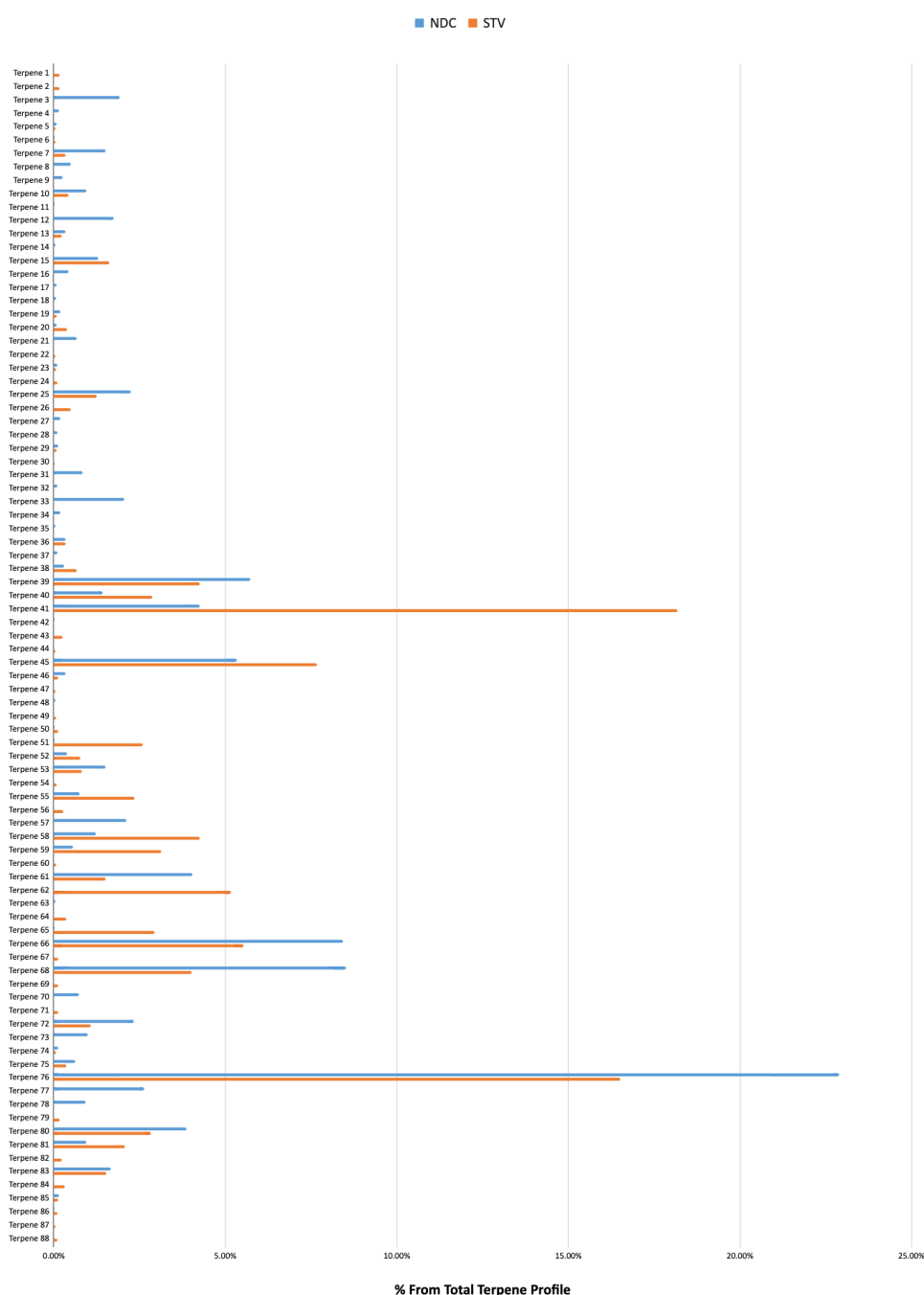
The total number of samples that were analyzed in the research is 4 "Sativa-like" (STV) samples and 4 "Indica-like" (NDC) samples. Sample preparation and GC/MS methods were performed at Professor Mechoulam's laboratory at the Hebrew University of Jerusalem, by Prof. Lumir Hanus. Intact plant material was extracted using methanol. The samples were then vortexed in methanol to disrupt trichomes and then shaken at room temperature. Then the methanol extract was centrifuged and filtered to remove precipitated waxes and starch.



Results

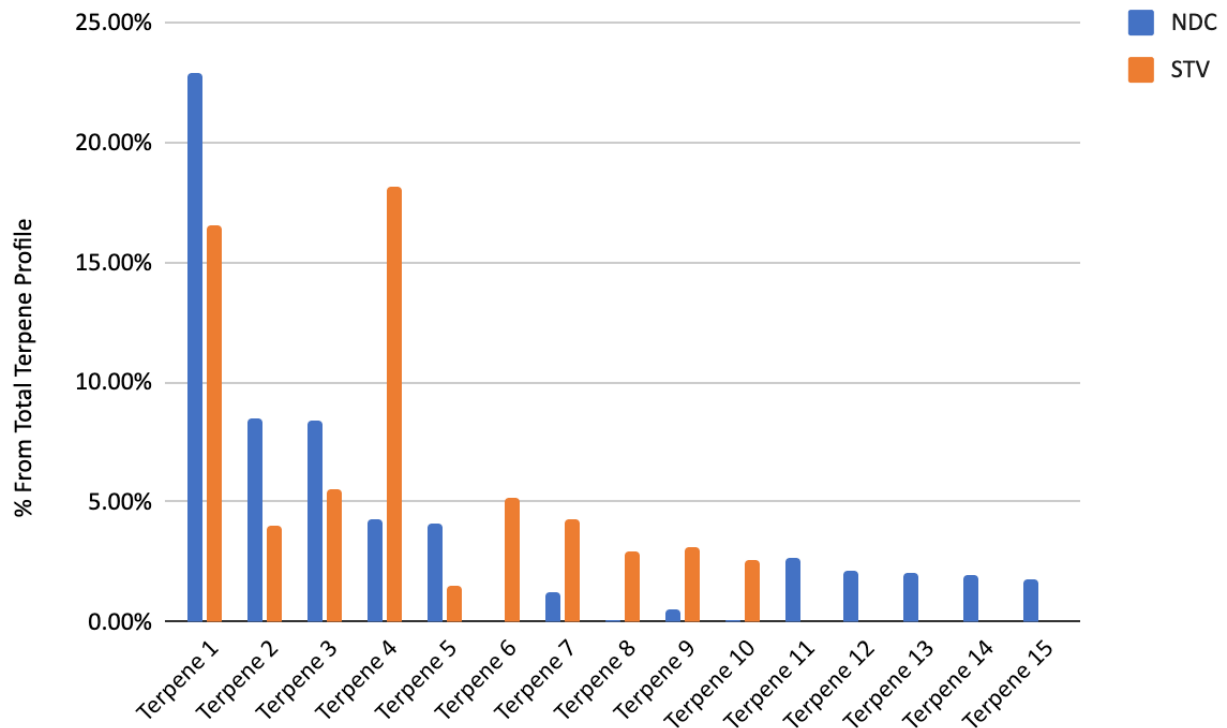
Results are based on patient reports which concluded to the 4 most effective "Sativa-like" (STV) strains and 4 most effective "Indica-like" (NDC) strains. Overall 88 terpenes were found in the 8 cannabis strains. The percent terpenes was normalized to the most abundant terpene.

General overview on the difference in the averaged terpene



On average, around 50 terpenes were measured for each strain sample. Distinct patterns in terpene composition have been observed between NDC and STV strains

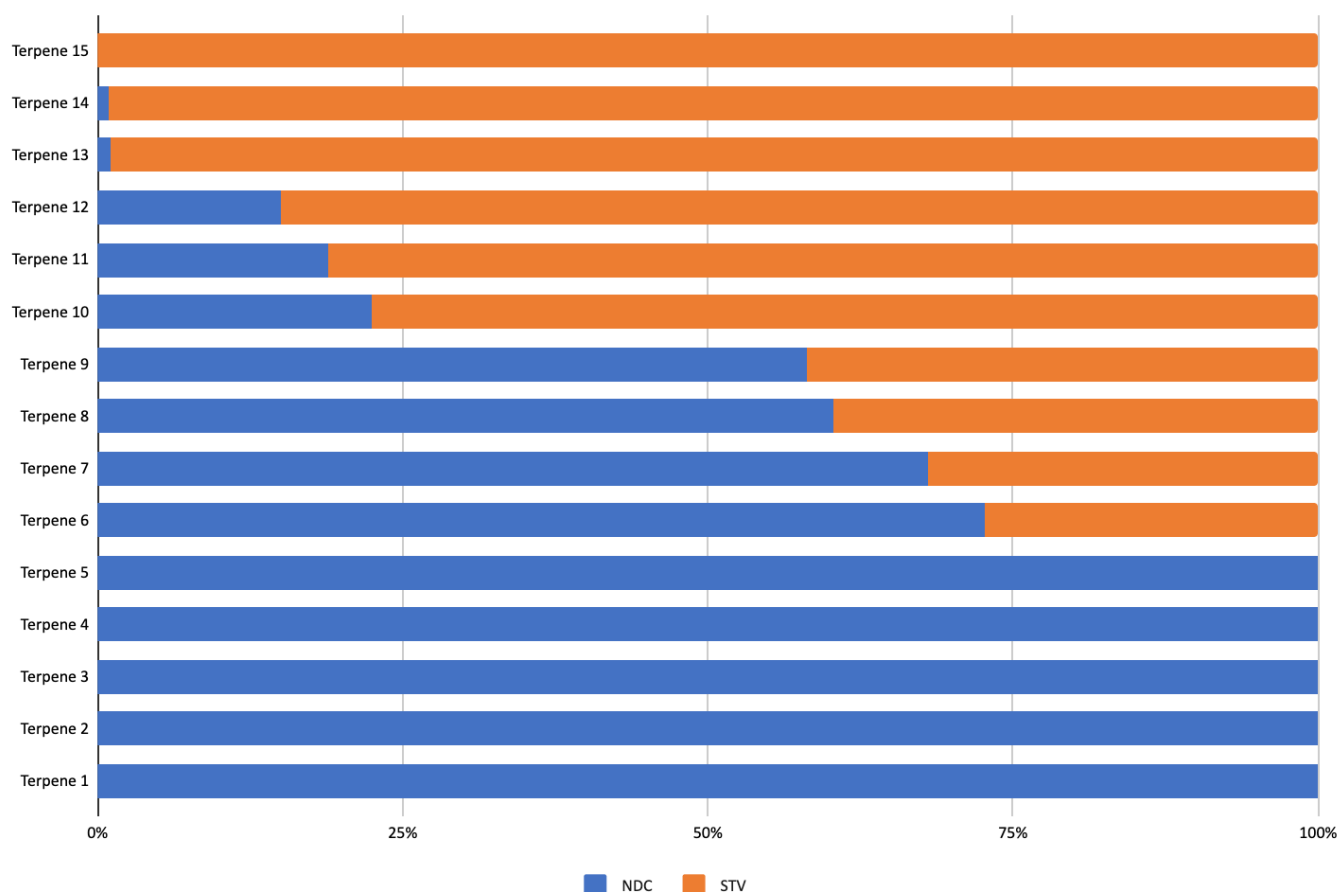
NDC and STV distinct terpene pattern



- ❖ There were more NDC distinct terpenes than STV distinct terpenes such as Farnesene
- ❖ Beta-Caryophyllene was shown to have higher levels in NDC strains and Beta-Myrcene was shown to have higher levels in STV strains
- ❖ Several minor terpenes have been shown to be consistently in higher levels in NDC strains such as Alpha-Bisabolol and Alpha-Humulene
- ❖ Terpinolene was not found in any of the NDC strains and was found in all of the STV strains



Average terpene distribution between NDC and STV strains, highlighting major difference in terpene pattern.



As shown in the chart above, Eybna's efforts with Seach Medical Group resulted in uncovering a certain terpene pattern that correlates to nighttime strains and daytime strains

The results provide us with the understanding that there is still much more to uncover when it comes to phytochemicals' effects on the pharmacological value of cannabis products.

This case study highlighted the phytochemical difference between nighttime and daytime strains and showed correlations between certain terpenes and effects. With the right data tools and people, Eybna aims at taking cannabis-based products one step towards targeted cannabis approach.