

LIVING IN A HOTSPOT OF CITY AND BIODIVERSITY THE CASE OF SYNECOCULTURE

Living in a city's hotspot is exciting but tiring in the era of pandemics. People start to scatter in rural areas, but if you want to keep your friends close, you should maybe keep nature closer or even augment the full benefit of biodiversity by yourself. Here is the case of Synecoculture in the urban environment, the way to construct amplified ecosystems with high diversity and functionality that sustain both human and ecological health.

Tokyo city contains 33% of the green area, and there are lots of things you can do to further facilitate the quality of life. We have introduced more than 200 edible plant species and established bountiful ecosystems on an urban ground and a rooftop garden to experiment with food production and the self-organizing process of soil microbial life. Compared to more than 7000 reference samples from all over Japan, 69 spots from our Synecoculture experimental sites (36 samples after four years of practice on a ground level and 33 samples after two and half years on a rooftop) showed significantly enhanced diversity and activity of soil microorganisms, which correlated with the high variety of introduced and coexisting plants (Fig.1). Rich biodiversity harbors complex biological interactions in ecosystems, which is known to stimulate the expression of secondary metabolites

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of plants (abundant in wild foods) that act as health-protective bioactive compounds in humans. As we collaborated with an elderly welfare facility and introduced coarse green tea produced in a Synecoculture environment supported by high ecological interactions, the rehabilitation performance and associated quality of life significantly increased in a 4-month light-load training. This has led to greater physical and cognitive independence in daily activity (Figure 2a).

Recent studies have suggested that modern urban lifestyles cause an increase in immune-related anomalies such as allergy, diabetes, cancers, and neurodegenerative diseases, through reduced diversity of the human gut microbiota. Rich soil microorganisms are also known to positively affect our epidermal and gut microbiota, especially immune system regulation. Such global increases in chronic diseases impose medical burdens and asset freezes, producing

significant economic losses that rise to half of the national expenditure in developed countries.

In another 3-month experiment of rehabilitation in an augmented ecological environment and integrative suggestions for lifestyle modification, significant improvements were recorded. These included positive data in inflammatory marker values (in-blood homocysteine) and cognitive function scores (Montreal Cognitive Assessment, MoCA) in seven elderly patients (Fig. 2b). These facts strongly imply that augmenting biological diversity in surrounding ecosystems and interacting with it through daily food habits and lifestyles would improve our health.

A city can be hotter in biodiversity if only you get your hands dirty. And if you have to eat a peck of dirt before you die anyway, why don't you swallow a bunch of beneficial soil microbiota and energize yourself with a science-minded tea ceremony?

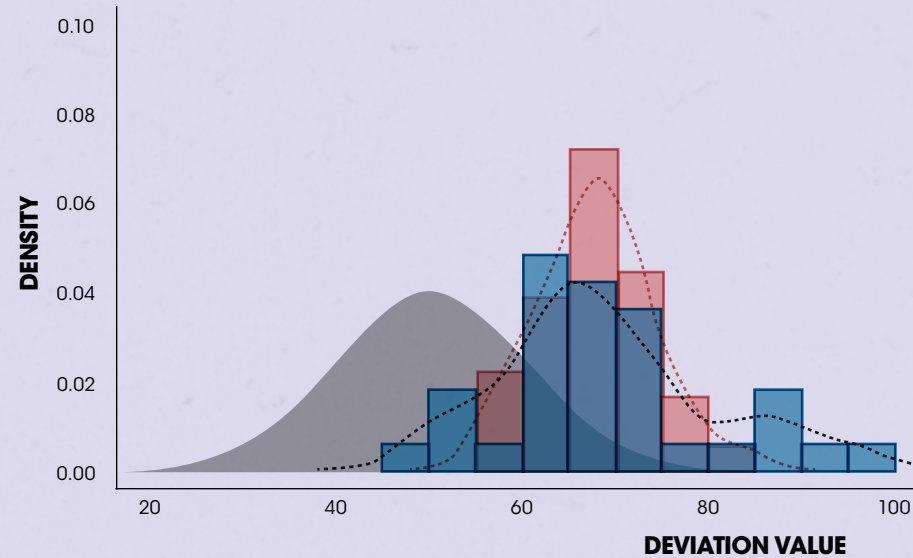
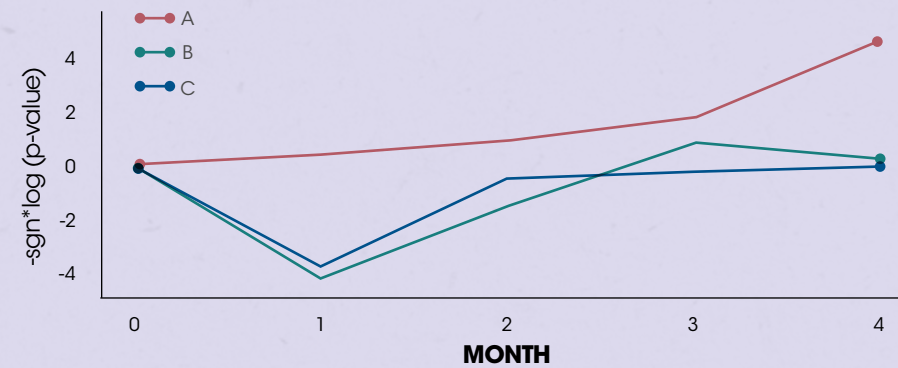


Figure 1. Distribution of Soil Microbial Diversity and Vitality Values (SMDVV) of the urban Synecoculture plots (Mean deviation value for urban ground = 67.9, rooftop = 69.1)

Reference
 Urban ground
 Rooftop

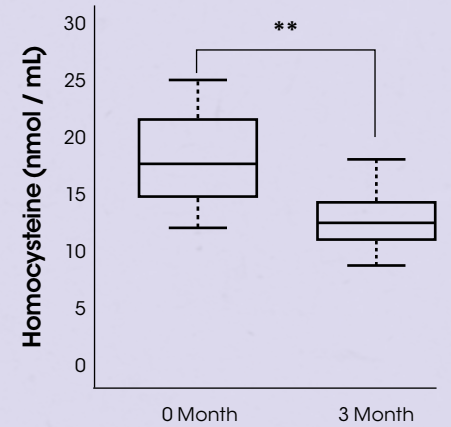
Figure 2a. Rehabilitation performance of 117 elderly persons evaluated with 18-item Functional Independence Measure (FIM). In a double-blind randomized controlled trial, group A (45 persons, red) consumed Synecoculture green tea, group B (42 persons, green) conventional green tea, and group C (30 persons, blue) drank hot water. Only group A achieved a statistically significant increase of the total FIM scores (significance level less than 1%), while the other groups remained insignificant. The grey dashed and dotted lines represent the significance thresholds $p=0.05$ and 0.01 , respectively.



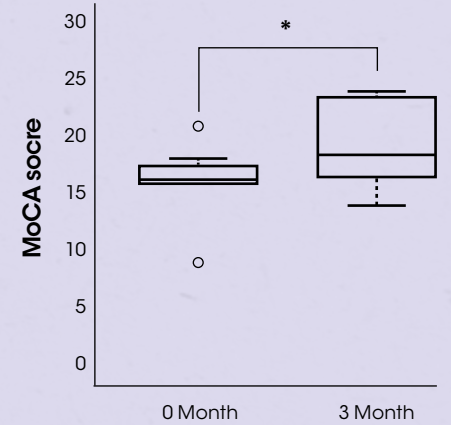
Quality of life measured by 17-point Philadelphia Geriatric Morale Scale (PGCMS) during the rehabilitation. Colored dotted lines represent the mean p-values that showed significant improvement only in group A (significance level less than 5%)



Figure 2b. Significant decreases in in-blood homocysteine after three months of a rehabilitation program with augmented ecosystem (n=7, p-value=0.00049, paired t-test)



** for p-value less than 0.01



* for p-value less than 0.05.

Bottom: Significant increases in Montreal Cognitive Assessment (MoCA) scores after three months of a rehabilitation program with augmented ecosystem (n=7, p-value=0.027, paired t-test).