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CORRELATION BETWEEN CLIMATIC FACTORS AND PESTS AND DISEASES IN DETERMINING THE PHYTOSANITARY STATUS OF NATURAL FORESTS IN THE CHATKAL MOUNTAIN REGION

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Abstract. In this study, based on the results of observations conducted in 2024–2025 in natural forest areas in the Chatkal mountain region, the relationships between key climate indicators (air temperature, wind speed) and pest and disease factors (uneven silkworm, hawthorn leafhopper, rust disease) were studied. The results of the correlation analysis showed that it has important scientific value in identifying the relationships between various factors and assessing the phytosanitary stability of forests.

Keywords: Chatkal mountain region, correlation, pests, unequal silkworm, hawthorn leafhopper, disease, rust, wind speed, humidity and forest phytosanitary condition.

INTRODUCTION. Chatkal Mountain in the region natural widespread nutty and mixed forests natural ecosystem as complicated bioeconomic to the structure has is, their stability climatic, edaphic and biotic factors mutual impact with is marked. Last in years this in the region's air temperature seasonal vibration, precipitation amount decrease and wind of the regime change forest phytosanitary to the state noticeable impact showing.

In addition, **pests (** Lymantria dispar L., hawthorn leafhopper) (**Archips crataegnus Hbn.)** and The biotic factors responsible for rust disease **(Gymnosporangium confusum Plowr)** weaken the physiological state of plants, reduce productivity, and slow down the natural recovery processes of the ecosystem.

When assessing the phytosanitary condition of forests, several variables — climatic factors, plant diseases and pest density - interact simultaneously. Therefore, determining their interrelationships through **the method of correlation analysis** is a scientifically sound approach. This method allows for a quantitative assessment of the influence of each factor on the forest ecosystem, as well as for predicting the dynamics of pest populations.

RESEARCH METHOD. Research works 2024–2025 during in the Chatkal mountain region natural widespread nutty and mixed forest in phylogeneses take went. Observations walnut (Juglans regia L.), almond (Amygdalus communis L.), hawthorn (Crataegus pontica C. Koch.), dog rose (Rosa canina L.) and other leafy tree-bush types own inside in areas of 200–500 m² done Phenological and phytosanitary observations were conducted monthly, under stable

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meteorological conditions (on the 20th–25th of the month). The following indicators were recorded during each observation period:

Air temperature (°C) was measured at a height of 1.5 m using an electronic thermohydrometer;

Wind speed (m/s) was determined using an anemometer and average values were calculated;

Pests number — mostly **pests (Peerless silk worm —** Lymantria dispar L., hawthorn gardener (**Archips crataegnus Hbn.)** insects 10 models for in the tree calculation method with determined ;

Plant diseases — in particular, **rust disease (Gymnosporangium confusum Plowr)** of on the leaves development level percent on account of evaluated.

Received all quantitative information **variation-statistics methods** based on again **Pearson correlation** was used. **coefficient (r)** using main ecological factors with pests activity between dependency level determined.

Correlation coefficient values following criteria based on interpretation done :

r = 0.7–1.0 – strong positive or negative dependency ;

r = 0.3–0.7 – moderate correlation;

r = 0.0–0.3 – weak correlation or statistically insignificant relationship.

Statistical analyses were performed using **Microsoft Excel** and **SPSS Statistics 26.0.** Based on the results, a temporal (dynamic) correlation graph between environmental factors and pest dynamics was constructed (Figure 2).

RESULTS AND ANALYSIS

Latest in years in the Chatkal mountain region naturally occurring nutty and mixed in the forests hawthorn berry (**Archips crataegnus Hbn.)** and the incomparable silk like the worm (**Lymantria dispar L.**) leaf-eater pests population increase of forests phytosanitary status sharp is worsening. Pests population dynamics and their egg to put density climate factors (weather temperature, wind, humidity) directly related is, this dependency correlational analysis through assessment ecological control system working on the way-out important importance has.

In the Chatkal mountain region during 2024–2025 take visited observations as a result climate factors with pests and diseases development dynamics between correlational dependencies determined.

Table 1. 2024–2025 for monthly climate indicators and pests monitoring (Bostonliq) district)

Moon	Year	Air temperature (°C)	Soil temperature (°C)	Wind (m/s)	Rust disease		Unparalleled silk worm		Hawthorn leaf grower	
					Dot (%)	Turkestan (%)	Dot (%)	Turkestan (%)	Dot (%)	Turkestan (%)
March	2024	8.2	5.6	2.1	7	8	14	12	9	8
	2025	10.5	7.1	2.3	9	11	16	14	11	9

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April	2024	18.9	14.2	2.3	13	15	20	18	16	14
	2025	19.2	14.5	2.5	16	19	23	21	18	16
May	2024	21.7	17.3	2.5	22	25	28	24	23	20
	2025	22.6	18.1	2.7	25	29	31	28	26	23
June	2024	30.2	24.7	3.1	30	33	18	16	14	12
	2025	31.4	25.6	3.3	34	38	20	18	15	13
July	2024	36.5	28.9	3.4	24	26	11	9	9	8
	2025	38.2	30.1	3.6	28	31	13	11	10	9
August	2024	29.3	24.1	2.9	19	21	8	6	7	6
	2025	30.6	25.0	3.1	22	25	9	8	8	7
September	2024	23.7	19.4	2.6	15	17	6	5	5	4
	2025	23.9	19.6	2.8	18	20	7	6	6	5
October	2024	16.1	12.0	2.2	11	13	4	3	3	2
	2025	15.8	11.8	2.4	13	15	5	4	4	3
November	2024	9.2	6.5	2.0	8	9	2	1	1	1
	2025	8.9	6.2	2.2	9	10	3	2	2	2

Air temperature and **pests number** between strong positive dependency record Pearson coefficient **r = +0.86** (Unequal silk worm for) and **r = +0.79** (Hawthorn leaf blower for) is, this is air warming with pests development activity increased shows. Especially in May– June in the months average air temperature above 30 °C was in periods larva number the highest record done.

Air temperature with **rust disease development** between and average level positive dependency determined (**r = +0.61**). This temperature increases with leaf on the surface breathing intensity change, epidermis thinning and pathogenic spores fast sprout to the exit conditions creation with explained.

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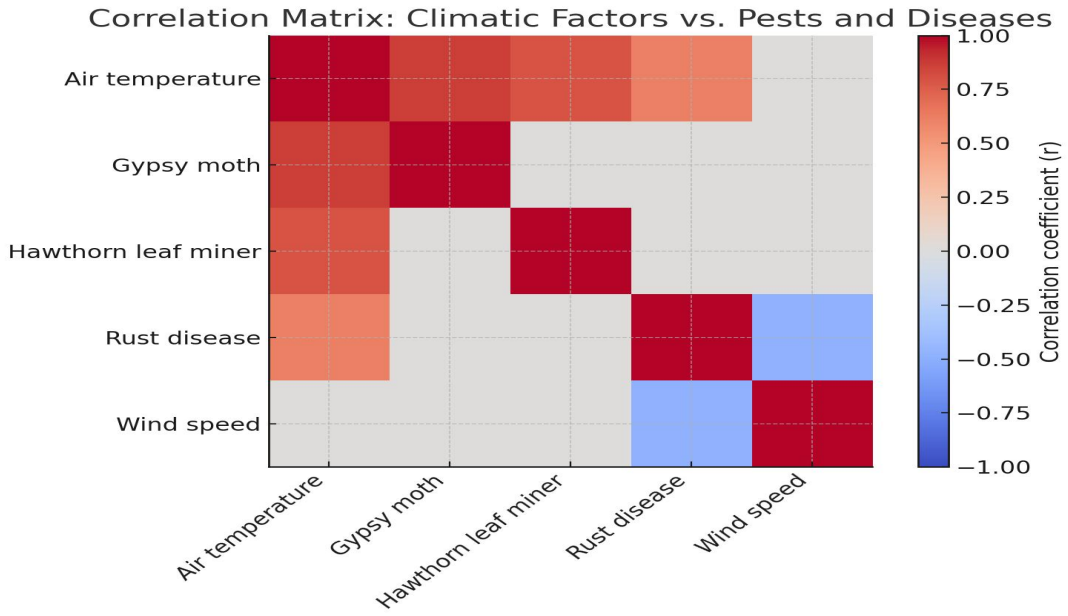

- **Red shades** indicate a **strong positive correlation** (as one increases, so does the other).
- **Blue shades** indicate a **negative correlation** (as one increases, the other decreases).

Wind speed and **pests number** between dependency average positive is, **r = +0.54,** which is and air currents insects spread facilitate means. However, wind speed too much outside in cases of increased (above 3.5–4.0 m/s) pests number a little decreased.

Wind speed and **rust disease** between and reverse dependency determined, **r = –0.48** value showed that there is a strong wind leaf on the surface humidity fast to evaporate reason become pathogenic spores development slowed down.

In general, learned in the period temperature increase with pests activity and disease development intensified if, the wind speed increasing disease level These trends indicate that the phytosanitary stability of forests is directly dependent on climatic factors.

Pairing	**Pearson coefficient (r)**	**Dependency power**	**Note**
Temperature ↔ Uneven silk worm	**+0.86**	Strong positive	Temperature increases with silk worm activity sharp increases.
Temperature ↔ Hawthorn leafhopper	**+0.79**	Strong positive	Warm climate leaf-eater insects number to increase reason will be.
Temperature ↔ Rust disease	**+0.61**	Average positive	Temperature increase leaf on the surface physiological changes brought remove; disease development accelerates.

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Conclusion : Temperature increase pests population and pathogens to develop comfortable conditions creates. Especially above 30 **° C** in periods larvae number the highest was.

Wind speed with dependency

Pairing	**Pearson coefficient (r)**	**Dependency power**	**Note**
Wind ↔ Pests	**+0.54**	Average positive	Wind insects to spread help But above 3.5–4.0 m/s at speed their number a little decreases.
Wind ↔ Rust disease	**–0.48**	Average negative	Strong wind leaf on the surface humidity reduce, pathogen development slows down.

Conclusion : Wind average at the level pests distributes, but very strong when negative impact shows. Diseases and wind decrease as it increases.

Received results, in the Chatkal mountain region forest ecosystem phytosanitary status mainly climatic factors with management shows. Air temperature growth during pests population for the most important stimulant as manifestation In particular, Lymantria dispar **L.** larvae for 25–32 °C temperature The range is optimal, and their growth and nutrition activity increased. **Archips crataegannf Hbn.** types the increase is the same in the period observed, this their development cyclical with directly suitable falls. With this together, high temperature in the background leaf surface structural changes **Gymnosporangium confused Plow** spores for comfortable conditions create, disease level increased. The wind moderate speed (2.5–3.0 m/s) insects to spread help gave although, strong winds on the leaf humidity reduce, pathogen fungi sporulation stopped.

Correlational analysis to the results according to, forests phytosanitary stability in storage **temperature and humidity** seasonal management with together, **wind mode is** also important ecological factor This is results based on pests population dynamics forecasting and biological struggle measures (e.g. Bacillus thuringiensis) Optimal use of medications periods determination opportunity is created.

Conclusion. The Chatkal mountain region held research as a result air temperature and wind speed with pests and diseases development between clear correlational dependency existence Temperature increase with **Unparalleled silk Wormwood** and **Hawthorn leaf blower** activity increased, **rust disease** The development has also increased. Wind speed when increased and pests spread simplified, but powerful wind leaf on the surface humidity reduce the disease development In general, forests **phytosanitary status climate factors directly related** that is proved.

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