AGRICULTURE IN THE NORTH-WEST INDIAN SUBCONTINENT DURING ~5600-3000YRS BP: ANALYSIS BASED UPON ARCHAEOBOTANICAL REMAINS.

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ABSTRACT

The human-plant relationship is very complex in nature this complexity depends upon the various factors i.e. the soil type, the water and the climate. During 5600 to 3000 yrs BP needs an analytical approach to study the complexity in the cultures in the area of the study. This paper gives a comprehensive perspective about the agriculture patterns through the in depth analysis of archaebotanical remains reported from the North-Western Indian Subcontinent. An attempt is being made to understand the crop type, cropping seasons and alterations in the cropping patterns. As the time slice of ~4,100 ±100yrs BP is considered to be an abrupt arid event in various palaeo records needs to be addressed for understanding its impact in North-Western Indian Subcontinent. We did a comparative analysis of the two cultures i.e. Neolithic and Harappan cultures to understand the changes in choices of crops and plausible reasons for it. This will give us a clearer understanding of the agricultural patterns in light of cultural change.

Keywords : *Archaeology, Plant remains, Archaeobotany, Neolithic, Harappan culture.*

Introduction

Plants are vital for both human livelihood and the structuring of ecosystem. The distribution of human-used plant species is essential to comprehend and protect the useful and intrinsic qualities. Though most of the plants species have the potential to serve humans, only a small percentage have been exploited for both material and non-material purpose. When the seeds of these plants come in contact with the fire, they get charred and are termed as archaeobotanical remains. These remains are separated from the soil samples by the process of flotation and thoroughly studied in the lab. The limitation with the present archaeobotanical data is recovery of lesser number of macro remains and low ubiquity of micro remains in the dataset. The lesser availability of certain plants which can be consumed in raw form has lesser possibility to be burnt purposely. Therefore, it becomes important to study micro botanical remains extracted from stone objects and ceramics. These macro and micro botanical remains have been collected from the various sites in northern and North-Western India which includes the region of Balochistan, Kashmir, Punjab, Haryana, Gujarat and sites in undivided India (Pakistan). There is an exhibition of enormous difference in botanical and zoological compositions, climate trends and precipitation in the Indian sub-continent.There are more than 1000 sites discovered in the region which includes large cities and small farming communities with thousands of inhabitants. The Neolithic and Harappan sites in the area of our study includes Miri – Qalat (Tengberg,1999), Nausharo (Constantini,1990), Harappa (Vats, 1931; Stapf, 1931; Webber, 2003), Gufkral (Kajale,1982), Kanispur (Pokharia), Kunal (Saraswat & Pokharia, 2003), Mahorana (Saraswat,1991), Rohira (Saraswat,1986,1988), Sanghol (Saraswat,1997), Balu (Saraswat & Pokharia, 2002) Burj (Bates, 2018) , Masudpur I (Bates 2017; 2018; Petrie et.al. 2017; Singh et.al. 2021), Masdpur VII (ibid.), Farmana (Shinde et.al.2008), Hulas (Saraswat,1993), Banawali, Rojdi (Webber,1991), Shikarpur (García-Graneroet.al.,2015) and Kammer (Pokharia, 2011). These sites in the North- Western Indian subcontinent yielded plant remains which played a crucial role in understanding the agriculture patterns and there usages in the varying climatic conditions (Saraswat 1986, 1992, 1995; Weber 1991; Tengberg 1999; Saraswat and Pokharia 2002, 2003; Fuller 2006; Pokharia et.al 2011, 2014). We could explore the use of plant for fuel, material culture, organization of society and their relationship with subsistence.

LOCALE

The research area ideally covers number sites present both in India and Pakistan. The macro and micro botanical remains are studied from the previous works published by Tengberg, Weber, Saraswat, Pokharia, Petrie, RN Singh, Bates, Fuller, Juan Jose Garcia-Granero etc. The sites in Pakistan fall under the region of Punjab and Baluchistan which has a diverse flora and fauna. The region of Ancient Punjab is fed by the perennial rivers and ephemeral streams with tropical vegetation i.e. mixture of dry and wet deciduous forests. The sites in Southern Haryana are on the dry alluvial bed of palaeo Ghaggar River once fed with ephemeral streams with semi-arid conditions. The vegetation is a mixture of thorny and dry deciduous type. The sites in Gujarat region have variation in arid and semi-arid type of climatic conditions. This region has ephemeral streams with mixed type of vegetation such as Mesquite, Mango, Date Palm, Neem, Indian jujube etc.

METHODOLOGY

In order to understand the agriculture patterns we need to look into its spatial distribution and chronology. We have relied on the published data from the archaeological sites such as Miri Qalat, Nausharo, Harappa, Banawali, Burj, Masudpur I , Masudpur VII, Balu, Hulas, Rohira, Sanghol, Rojdi, Kanmer, Shikarpur, Rohira, Kanispur , Burzoham, Gufkral which not only explains the spatial aspect but also the chronology. This paper exhibits adequate information based on clearer understanding of macro and micro botanical remains reported so far in this region. The time span of the study inculcates cultural period beginning from the Neolithic times to Late Harappan period. As the radio carbon dates and contextual archaeology of the various sites confirms the time bracket taken for the study. We also get evidences of botanical remains both micro and macro nature.

Table 1. Agricultural crops recorded from the Neolithic and Harappan period in North and North-Western India. Adapted from various sources viz. (Saraswat, 1992); (Tengberg, 1999); (Saraswat and Pokharia, 2002); (Pokharia et.al.,2014); (Petrie and Bates, 2017) and (Wagner ,1983) plants database.

Agricultural crop	Crop type	Origin	Growing season	Sowing month	Total growing period	Amount of precipitation required	Soil requirement
Hordeum Vulgare (Barley)	Cereal	Near East and Mediterranean region	Winter/Rabi	Mid Oct-Early Nov	4-5 months	500-1000	Well drained fertile loam/light-clay soil
Triticum sp. (Wheat)	Cereal	Near East and Mediterranean region	Winter/ Rabi	Nov	4-5 months	700-900	Loamy, Clay loamy & sandy loams
Oryza Sativa	Cereal	India/China	Summer/ Kharif	Jun-Jul	3-5 months	1800-2000	Neutral soil (heavy), clay, clay loam, Loamy
Setaria sp. (foxtail millet)	Minor Cereal	China	Summer/ Kharif	Jun-Jul	2-4 months	less than 600	Sandy to Loamy soil
Cicer Arictnium (Chickpea)	Pulses	Southwest Asia Levant	Winter/ Rabi	Oct-Nov	4-6 months	500-1800	Heavy clay to light loam
Lathyrus Sativus (Grass pea)	Pulses	Southwest Asia Levant	Winter/ Rabi	Sep-Oct	2 months	400-650	Loamy-sandy-loam soil
Lens Culinaris (Lentil)	Pulses	Southwest Asia Levant	Winter/ Rabi	Oct-Nov	4-6 months	600-1200	Light loamy sand to heavy clay soil
Macrotyloma Uniflorum (Horsegram, Kulthi)	Pulses	Indian Savannah & Peninsula	As fodder (Kharif) As food (Winter/Rabi)	Jun-Jul Oct-Nov	3-4 months 4-6 months	less than 600	Loamy-sandy-loam soil
Vigna Mungo (Black gram)	Pulses	India- Forest, Savannah margin including inner western ghats	Summer/ Kharif	Jun-Jul	2-3 months	less than 600	Sandy to Heavy Loamy soil
Vigna Radiata (Green gram)	Pulses	India- Forest, Savannah margin including inner western ghats	Summer/ Kharif	May-Jun	3 months	600-750	Sandy loam to black soil with good drainage capacity
Gossypium sp. (cotton)	Fibre	India	Summer/ Kharif	Jun-Jul	more than 6 months	700-1300	Black soil and well drained deep alluvial soil
Linum usitatissimum	Oil	Near East and Mediterranean	Winter/ Rabi	Oct-Nov	more than 6 months	700-750	Well drained fertile medium & Heavy Soil
Sesamum Indicum (sesame)	Oil	India	Summer/ Kharif	Jun-Jul	3-4 months	500-700	Sandy Loam to Heavy black soil

DISCUSSION

Paleontological records reveal that the modern man came into the space about 40,000 ton 30,000 years B.P. and in no time spread throughout the earth. The activities like polishing, grinding and tools give him an edge over other species in the earth. This was all due to high cranial capacity as a result hunting increased which resulted in 'Pleistocene overkill'. This interaction of man with fire and animals impacted the ecosystem. The important milestone came 10000 years B.P. with the development of agriculture which made a man a food producer. The practice of sedentism not only strengthened man's social skill but also led to development of village communities. V. Gordon Childe has termed this phase as a Neolithic Revolution. Our understanding about the agriculture has been increased by the archaeobotanical remains. These ancient plants when studied in detail help not only to trace the history of crops but also explain their origin and spread in the world. The palaeoethnobotanist from last few decades have utilized their data to study the agricultural and subsistence strategies.

NEOLITIHIC AGRICULTURAL PATTERN

In the time span of 5600 years BP to 3000 years BP the plant remains from Neolithic levels of Kanispur, Burzahom and Gufkral in North India and Miri Qalat & Nausharo in North Western India were taken up for study.The available data revealed that main agriculture strategy in Miri Qalat and Nausharo was based upon winter crop with double cropping in a single season. This could be seen from cultivation of wheat and barley together along with pulses like Lens culinaris(Lentil) only. The charred seeds of date palm were also reported but morphology revealed them to be of wild species obtained by gathering which shows absence of summer crops. Even the seeds of einkorn and emmerwheat were wild kind (Tengeberg, 1999). On the other hand the plant remains in Kashmir region revealed winter crops like wheat, barley, lentil (Lens culinaris)suggested only single cropping system. We also get remains of horticulture crops like peach, apricot and walnut indicates awareness of the edible quality of these crops. The only change observed between these two regions was the difference of percentage in cereal crops where ubiquity of Barley was higher than the wheat in Miri Qalat and Nausharo and vice a versa in Kashmir. The later period of these sites showed addition of Almonds, Field pea (Pisum arvenese) and Lathyrus Sativus and other weed seeds indicating high agricultural activity.

HARAPPAN AGRICULTURAL PATTERNS

As the plant remains exhibits adequate information to deduce the agriculture pattern and strategies adopted.To understand this better we need to look into the (i) Indus core zone and (ii) Peripheral zone (Pokharia Et.al 2014). The Indus core zone consist of the sites in ancient Punjab which are Harappa, Kunal, Balu, Masudpur I & VII, Rohira, Sanghol, Mahorrana, Burj. This region is fed by perennial and ephemeral streams of water. The SW monsoon has also influenced the agricultural strategies of this region from years. We get macrobotanical remains from Early Harappan period which suggest double cropping patterns with winter and summer crops like wheat, barley, lentil, oilseeds, millets, weed seeds and rice (?). The change which can be seen from Neolithic agriculture patterns is the advent of summer cropping strategy which could be due to higher demand or change in precipitation. In the Early period barley is the chief crop based on the ubiquity (Weber, 2003).The remains of fruit seeds and horticulture crops also add to the agricultural strategy.In Mature Harappan Phase we see the same pattern as in the Early period with addition of few summer pulses (Vigna radiata/mungo,Macrotyloma uniflorum), cotton and jute.The change is in increase in wheat consumption compared with barley and presence of emmar wheat in few of the sites. The presence of rice is still questionable (Fuller,2009). In the late phase we see the similar strategy but the debate of rice which is found in the late levels of Hulas (Saraswat,1993)as an important cereal crop intensify due to the impact of 4100 kya in the Late Mature phase in the core region. The peripheral zone points out a different agricultural strategy with more focus on summer crops and ubiquity of the sites like Rojdi, Kanmer reveals higher percentage of millet seeds. We also get wheat from Shikarpur in this region but in very low quantity but barley from Rojdi points out more focus on less water demanding crop in arid and semi-arid region. The cultivation of pulses like black gram, moong and horse gram also laid stress on summer cropping.

CONCLUSION

The analysis of agricultural patterns in the North-western India subcontinent reveals that in the Neolithic period there was cropping of winter (Rabi crops) due to the wetter conditions. The trend is different in case of sites in in Harappan context where we see double-cropping season. The micro botanical analysis reveals use of spices in the diet and even the residual analysis of the pottery confirms the same. In the Early phase we see more preference for barley but it shifts towards wheat in the mature phase. The transition of agricultural pattern could be seen in the later phases where cultivation of millets is preferred. We do get evidences of millets in earlier phases but their ubiquity is low and in some cases morphology reveals them to be of wild nature. In the Harappan context we get to see a complex agricultural pattern which enhanced productivity through rotation of cereal crops and pulses to improve soil fertility. The plant remains in the region represents complexity as an expression of various adaptive strategy to climatic variations.

Conflict of Interest Statement

The authors whose names are listed immediately below certify that they have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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