WATERWORKS IN MUGHAL GARDENS

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Like Persian and Central Asian gardens water became the central and connecting theme of the Mughal gardens. The beauty of Babur's *chaharbagh* was the central watercourse and their flowing water. However, the main characteristics features of Mughal garden were fourfold rectangular or square ground usually walled with intersecting water channels which makes cross lined with walkways (*khiyabans)*, a tank or tanks often one in the middle, well or wells subdivided to create the same module on different scale depending on the area enclosed.[1] Usually where the water channels intersect there could be either a water tank or pool or fountain or a *chabutra.* Most of these gardens were divided into four quadrants by two axes comprised with water channels and pathways to carry the water under gravitational pressure.[2] **(Plate 1)**. The early gardens were irrigated from the wells but the construction of canals provided more adequate and dependable water supply[3]. If the water was not quickly replenished by some source or means it was consumed and lost as the result of the evaporation and seepage so the most important aspect was the permanent source of water supply. In this paper an attempt is made to trace the outside water source as well as inside distribution of water in the paradisiacal Mughal gardens.

The principal source of water to the Mughal gardens were: (i) lakes or tanks (ii) wells or step-wells (iii) canals and (iv) natural springs.[4] Tanks or lake have been used as a main source of water in Northern India since long.[5] After the battle of Panipat the first site visited by Babur was *hauz-i-shamsi* built under Iltutmish and *hauze-i-khas* of the Khalji period.[6] Babur's description of Hindustan for the lack of 'running water'[7] is not tenable because evidence of the presence of tanks and canals speaks otherwise. The effective reasons of Babur's observation was probably due to the fact that all these hydraulic projects here provided water for cultivation of crops while Mughals eulogized gardens with free flowing water.[8] Actually his description suited around Agra region which was deeply dissected terrain which restricted canal development. Babur himself mentions the existing reservoir and tank on which he constructed water garden at Dholpur and Fatehpur Sikri and for that water was lifted through Persian Wheel.[9]

In the Upper Gangetic plains wells were the chief source of irrigation,[10] they also became important for watering Mughal gardens. The well was variously termed as *chah* or *wa'in* or *ba'oli*[11] Babur himself ordered a 'chambered well' (*wa'in*) to be built on the site where he built his first garden Ram Bagh at Agra [12]. The water lifting device

for Mughal gardens from wells and step-wells were *charas* or the leather bucket, lifted by yoked oxen, pulling a rope thrown over a pulley. These were the most common devices near Agra which was criticized by Babur as 'laborious and filthy way'.[13] Another device was surface wheel (Ar. *noria*) based on lever principle which was installed on the sides of lake and was generally in use wherever the water level is close to surface[14]. The most effective water lifting device for the use of garden was '*saqia*' or 'Persian Wheel'[15] which Babur found a novelty (because he had not witnessed it in Central Asia and Afghanistan) with its chain of pots and pin-drum gearing[16]. Water was lifted to the great height at Fatehpur Sikri by a series of geared wheel installed there[17]. According to Elizabeth Moynihan, Persian Wheels known as *rehant* in India were built into the corner towers of the supporting riverfront wall with supplemental wells on a lower terrace. These fed the water-courses and pools and their overflow irrigated the plots'.[18] Thus *rahat* or *saqia* and *pur* system provided water from the wells in the gardens of Humayun's tomb at Delhi, Akbar's gardens at Sikandra and Fatehpur Sikri, Lotus garden of Babur at Dholpur, Bagh-i-Jahanara, Bagh-i-Zahra and Bagh-i-Nursarai at Agra, Shalimar Bagh at Lahore, Bag-i-Hayat Bakhsh at Shahjahanabad and almost in all the Mughal gardens in the plains.[19] Moynihan had reconstructed a water lifting plan which shows the stages of water lifting in the garden of Taj Mahal which system was earlier used by Akbar in the palace of Fatehpur Sikri..(**plate 2**)

The most important development was the construction of canals by harnessing of big rivers in Northern India. Although the famous canal *nahr-i-faiz* or *nahr-i-bahisht* also known as *shahnahr* (royal canal) which provided water to the gardens near the capital Delhi was built under the reign of Shah Jahan but its origin goes back to the canal of Firozshah Tughlaq (modern West Yamuna canal), that originated from the river Yamuna[20]. This was the main canal which in the palace of Shahjahan flowed like the 'water of life' from the Shah Burj through *hammam* , *diwan-i-khas, khwabgah* and *rang mahal* and its branches served the individual gardens and houses. The pavilion and halls for the emperor Shah Jahan and his *zanana* were threaded with this canal along the riverfront and mainly it became the source of water for the two gardens Hayat Bakhsh and Mahtab bagh of the palace and also for its two pavillion Sawan and Bhadun[21]. Another important canal, 'Shahnahar', provided water to the gardens of Lahore, was excavated during the reign of Shah Jahan and took water from the river Ravi at Shahpur up to the Lahore, a distance of 84 miles.[22] This canal, also known as Hasli canal, was constructed on the advice of Ali Mardan Khan, a famous canal engineer and viceroy of Lahore and Kashmir in the year 1631 AD with the help of Mulla Alaul Mulk Tuni, an expert in

hydrology. After the completion of this canal, the site of the famous pleasure garden Shalamar of Shah jahan was chosen on the newly dug canal which formerly provided water to the Shalamar garden but later on the *ulama* and nobles were also allowed to irrigate their gardens.[23] Thus, the construction of canals from the river provided more dependable water supply and the watercourse became more widely studded with fountains.[24]

In Kashmir where the source of water was natural springs, the Mughals laid out canal to water their garden from the streams coming down from the surrounding mountains.[25] In Kashmir also canals were laid-out even before the Mughals. Pir Ghulam Hussain Koyahami, the authors of *Tarikh-i-Hasan* informs us that Sultan Zainul Abidin laidout a canal named as *Shah ju-i-nhr* to water the gardens and for the general use of public which was the fifth canal of the river Sandhar.[26] Later the Mughal nobles brought out the water of the same canal to the garden Bagh-i-Ilahi, Bagh-i-Bahr Ara, Bagh-i-Gulshan, Darshani Bagh and Bagh-i- Inayat etc.[27] Jahangir built a canal named 'Jui-i-Shahi' to water his garden Nur Bagh from Lar (Sind) and Shahjahan laid-out another named 'Shahnahr".[28] A canal was built by Jahangir to water the Shalimar Bagh brought out from the river Haroon which was further carried out by Asaf Khan for his garden Nishat Bagh but it was later stopped by Shahjahan to Nishat Bagh.[29] The author of *Tarikh-i- Hasan* furnishes very interesting information that why it was stopped by Shahjahan and then the emperor issued a *farman* to reopen the canal to Nishat Bagh, especially on the condition that it should not be harmful to the villagers.[30]

The waterworks inside the Mughal gardens were based on 'symbols' as they loved symbolism and gave it important consideration in their gardens inspired from Persia and Central Asia. The terraces in Mughal gardens represented those of the Quranic gardens of the Paradise.[31] Octagon pools and platforms in their early gardens was a favourite design of the Mughals but later Shahjahan usually used the square. So the octagon, evolved from the squaring of the circle, it symbolizes reconstruction of the material side of man, represented by the square with the circle of eternity.[32] Four water channels symbolized the heavenly rivers of honey, milk, wine and water and also representing four rivers of life.[33] The fountain was the symbol of 'life cycle' which rises and merges and again rises. The Paradise itself has two fountains *Tasneem* and *Salsabil.*[34] Muhammad Salih Kanbu , a native of Lahore, described very artistically the water system and its symbolic meaning in the garden of Shalamar at Lahore that 'in the centre of this earthly paradise a sacred stream flows with its full elegance and sweetness and with its chanting, fascinating and exhilarating nature and passes

through the gardens irrigating the flower beds. Its water is as beautiful as greenery. The vast stream is just like clouds pouring rains and open the doors of divine mercy. Its chevron patterns (*abshar)* are like an institution of worship where the hearts of believers are enlightened.'[35] For these symbolic features of the Mughal gardens water became the central theme and urgent need. In the absence or lack of water, one can not even think about the existence of Mughal paradisiacal gardens. As a matter of fact when Babur came to India he was in search of hillside spring like Persia and Central Asia where he could lay symmetrical terraced garden with rippling water from one terrace to another in a series of waterfall which was later found in Kashmir and gardens were laid-out with certain improvement and development by his successors. But he came across the plain of Agra, became disgusted and criticized its lack of 'running water'.[36] So he gave particular stress on running water in his garden and built artificial terraces with water-chutes and fountains to fulfill his ideal of garden in the Bagh-i- Neelofar (Lotus garden at Dholpur), Ram Bagh (Aram Bagh or Bagh-i- Gulafshan) and Bagh-i-Hasht Bahisht located on the bank of river Jamuna at Agra.[37]

Ebba Kosh has divided the architecture of Mughal gardens into three formal versions of *chaharbagh* which shed lights of 'water system': (i) a canonical cross-axial: the tomb of Humayun , (Delhi,1562-71) (ii) terraced: Shalimar garden, (Kashmir, 1620, 1634) and (iii) waterfront: Taj Mahal, (Agra, 1637)[38]. In the first category comes typical *chaharbagh,* consisted square, divided by cross axial paved walkways into four equal parts and later sub-divided into further quadrants within centre a garden pavilion and also a tomb or mausoleum or a pool (*hauz*). The funerary gardens of Humayun, Akbar and Jahangir are the best example. The second type is natural terraced garden which the Mughals inherited from their homeland and developed in Kashmir by laying out on a slope into the landscape of the region. The water was collected from the spring and the individual terraces were given separate canonical four-part like the Shalimar garden of Kashmir. Thirdly the waterfront gardens where the source of water was not wells or an artificial tank of lively springs on a mountain slope but a large slow flowing river from where the running water was raised to the gardens. Babur's choice of the riverfront side created riverfront gardens as a module of the riverfront city, a *chaharbagh* with the main building on terrace overlooking the river. In this type the main building was not in the centre as in the classic *Chaharbagh* but was on the terrace (*kursi*) running along the riverfront and the *chaharbagh* component was on the landward side. Taj Mahal was its best example and after idealized there this scheme was used in the residential garden Angoori Bagh in Agra fort by Shahjahan. Later it was adopted in Shahjahan's new city

Shahjahanabad at Delhi for the gardens and courtyard of Red Fort. It was also realized to certain extant at the other Mughal capital Lahore.[39]

The gardens inspired by nature was first developed by the Mughal emperor Babur in Farghana valley where were the slopping site to achieve the similar effect but in the Indo Gangetic plains like Agra and Delhi where the main source of water was well, tank and mainly the large river they developed hydraulic system by using Persian wheel to lift the water and obtained adequate pressure necessary for Mughal gardens. The main reason behind the location of gardens on the bank of river was that water was raised to the level of the enclosure wall by Persian Wheel standing on the bank from where it was conducted through aqueduct, to the garden where it ran from the top of the wall in a terra-cotta pipe which also produced adequate pressure needed to work the fountains.[40] In the Shalamar garden of Lahore, built in three terraces the main source of water was canal (Shahnahr) built by Ali Mardan Khan but as the strong current was needed to fill the large tank in the second terrace and for remaining cistern in the third terrace, two large well *Baran Hataa* (twelve wheels) were constructed outside the garden in the West and East side of the uppermost terrace and aqueduct were constructed on the top of the wall to convey the water of the wells to the second and third terraces[41] **(Plate 3).** Usually the main channel which used to connect the water source and garden was aqueduct, conducted the water to the tanks or pool for further distribution whether in the gardens of plain or in Kashmir.[42] Sometimes canals directly entered to the gardens through the wall and travelled the whole garden through the terraces by supplying waters to the pools, water-chutes and fountains. In the Shalamar garden of Lahore, the canal brought from the river Ravi entered the garden from South, flowing the main canal and filling the central tank, intersected the beautiful garden and discharged itself in the main tank of middle terrace by rippling its water through marble cascade and from there the canal water was passed into the lower terrace. Eventually it flowed out the Northern side of the Shalamar garden.[43]

Thus, to fed the Mughal gardens with nature there were two forces that brought water in the whole garden smoothly. One was natural gravitational force which was applied in the naturally terraced garden like the gardens of Kashmir which offered a new opportunity like Persia where water was not laboriously raised with wheel from the mountain but steep mountain slope provided dramatic water landscape. Powerful streams and springs from the hill fell in the garden with strong force over water-chutes, fountains and pools. Here terrace succeeded over the terrace through the artificial waterfall like the three terraces of Shalimar, twelve terraces of Nishat Bagh, six of Pari Mahal, seven

terraces of Dara Shikoh,s garden and many more.[44] If their sites of the gardens were not fit for terraces the Mughals made artificial terraces even on the slightly slopping site to provide the gardens the artificial gravitational flow and after that the hydraulic pressure by Persian wheel made the flow more smooth.[45]In words of Sylvia Crown, 'where they (Mughals) were given natural paradise like Kashmir they responded to the full, but when the conditions were not there, they could still create their own paradise'.[46]

Inside the gardens they used wells, octagon and square tanks in the corner of the garden to provide the water through water channels to the central tank and to the whole garden by cascading into different tanks or pools and also through terra-cotta pipes to the plots of flower and fruit beds for irrigation and especialiy to the fountains.[47] A separate underground channel was also there which took its course from the original tank to the central tank, *hammam* and wherever needed water in larger quantity.[48]

Other very important and artistic water device was *abshar* (water-chute) and fountain which indeed gave life to the Mughal gardens. Water-chute was a characteristic feature of Mughal garden and to this they gave the name *chaadar* meaning white 'shawl' of water. These water-chutes were, usually, made of marble or stone with the design carved as fish scale (*mahipusht*[49]) to produce a rippling effect (**Plate 4**).[50] Generally these water-chutes were connected with the source of water through water channels, from where the water was thrown up and broken into splashes by running over them. The water through the tank to the channels of causeways was down through *chaadar* or chutes and the water from the canals in the garden also used to discharge from one terrace to another and from one pool to another or to narrow water channels through these marble chutes by rippling and cascading over these stone chutes. The *chaadar,* under the surface of crystal clear water with niches (*chinikhana)* in which flower vase was placed in the day and candle light at night behind the curtain of water, indeed looked much beautiful[51](**Plate 5**) Salih Kanbu has described very beautifully the symbol of *chaadar* and candle light in the Shalamar garden of Lahore by saying 'the chute of water together with the lamps appears to be spreading beads and arches along with cascades which are shining like scholarly people'.[52] These chutes were much effective where the ground was in the series of terraces like Kashmir and Lahore but even in the plains with the slightest slope of only one or two feet, Mughals created charming waterfalls in their gardens.[53] The inspiration was directly drawn from the Persian and Central Asian dancing spray and white foam from the natural springs of the mountains. Generally water-chutes had stairs on both sides and ends in small ponds.[54] The beauty

and importance of these *abshars* is very nicely marks out by James Dickie. In his words: 'transition in level in a Mughal garden is effected by the *abshars*. Since the Muslim mind apprehends reality in terms of pattern, the surface of the water is inlaid with chevrons to emphasize the movement of water, or carved in a fish-scale pattern to produce a rippling, coruscating effect; in a word, the water becomes a liquid arabesque. Thus the water links dynamically the two levels: the upper, or tectonic, the lower, or vegetal'.[55] When even in the gardens of plain where small amount of water was available, the waterfall became the striking features of Mughal gardens, the abundance of water in Kashmir inspired its gardens with more effective cascaded into imaginative *chaadars*. Glittering water surrounded and flowed under and through the buildings and the emperor throne was often built across the canals above a cascade and seemed to float on the water where water splashes out over the *chaddar* .**(Plate 6)**[56]

Fountain which symbolizes the life cycle by rising, merging and again rising became a very important feature of the Mughal gardens. The author of *Mirat-i-Sikandari* informs that the idea of constructing pleasure gardens with fountains came in Gujarat from Persia at the time of Sultans.[57]The single jet from Persian tank finally developed into hundreds of fountains in the later gardens of Shahjahan.[58]As already discussed that in the plain water was raised to the level of enclosure wall by Persian Wheel and thence by an aqueduct it was conducted to the garden. This procedure produced the head of water, necessary for the pressure to work the fountain. The fountain, apart from the canal water, was also fed by independent arrangement which included wells and elevated large reservoirs outside the gardens. Generally an earthen colaba, made of glazed terra-cotta, supplied water to the fountains. There were separate concealed channels for the fountains installed in the centre of the pool.[59] Usually the weak gravitational force provided low fountain and high provided high. In the heavy flow of water like in Kashmir there were a long row of the jets of water. These fountains were linked with each other by the underground glazed terra-cotta pipes for uniform supply of water and circular pits with spouts made of marble in the shape of lotus bud.[60] Thus the pools, tanks and canals were full of fountain jets which played continuously in the canals and pools with whitened spray and the Shalamar garden of Lahore itself had 450 fountains and the pressure was so high that the water was thrown up in jets twelve feet high.[61] The glistening water shoots up almost four meters high and dropped back to a rippling pattern on the water surface. The returning jets of water from fountains created a delicate floral pattern on some pools.[62]

In this manner, earlier Mughal gardens were almost purely Persian and there were a feeling of the scarcity of water in the minds of the early Mughal architects because with the passage of time the narrow rills which is still narrow in the Humayun's tomb garden at Delhi developed into wider canals and great tanks of Shalamar (Lahore), twenty feet wide, as the Mughal discovered the joy of cool air by the large sheet.[63] For all these hydraulic works a high level water management was needed. There was no lack technical and experienced officials like the outstanding engineers Ali Mardan Khan, Mulla Alaul Mulk Tuni and Haidar Malik who showed their talent. Thus, water played most important role in the Mughal gardens, whether as a pool, channel, *abshar* and fountain or to irrigate the flower and fruit beds. However, Jellico rightly observed that in a Mughal gardens 'water' was perhaps even more important than 'soil'.[64]

NOTES AND REFERENCES

1. James Dickie, 'The Mughal Garden: Gateway to Paradise., *Muqarnas,* vol.III, (1985), p.133.
2. Irfan Habib,'Notes on the Economic and Social Aspect of Mughal Gardens', in James L. Wsetcoat Jr. and Joachim Wols – Bulmahn, (ed.), *Mughal Gardens: Sources places, Representations and Prospects,* (Washington, 1996) p.127; Sylvia Crown, Sheila Haywood et.al, *The Gardens of Mughal India,* (London, 1973), pp.16-17; James Dickie, op.cit., *Muqarnas*, p. 128; Syed Ali Nadim Rizavi, 'Iranian Influence on Medieval Architecture' in ed., Irfan Habib, *A Shared Heritage, the Growth of civilization in India and Iran,(AHS,*2002), p.129.
3. Elizabeth B Moynihan, *Paradise as a Garden in Persia and Mughal India,* (New York, 1970), p.100.
4. Iqtidar Hussain Siddiqui and Irfan Habib have discussed about the constructed means of irrigation in pre-Mughal and Mughal India. See Iqtidar Hussain Siddiqui,' Water-works and Irrigation System in India during Pre-Mughal Times', *Journal of the Economic and Social History of the Orient*, Vol.29, No. 1 (Feb., 1986),pp 52-77; Irfan Habib, *Agrarian System of Mughal India (1556-177),* second edition, (New Delhi, 1999), pp.24-36.
5. Cf Irfan Habib, *Agrarian,*p.30 where he has given the example of Sudarshan lake at Girnar built under Chandragupta Maurya and used for irrigation under Ashoka.
6. Zahiruddin Muhammad Babur, *Baburnam* , tr. AS Beveridge,LPP, (New Delhi, 1989) pp.475-76. Anthony Welch, 'Gardens that Babur did not like: Landscape Water and Architecture for the Sultans of Delhi', in James L. Wsetcoat Jr. and Joachim Wols – Bulmahn, (ed.), *Mughal Gardens: Sources places,* p.61. Ibn Batuta informs us that hauz-i-shamsi served for irrigation and its sourse of water was not only rains but the river Jamuna also (Ibn Batuta, *The Travels of Ibn Battuta*, Eng. tr. Sir Hamilton Gibb, (Cambridge 1971), vol. 3, p. 624). Evidence exists of the presence of tanks, lakes and cisterns in the regional kingdom of Delhi Sultanat like Kankariya tank in Ahmadabad around which a number of villas and pleasure gardens were constructed (Ali Mohammad Khan, *Mirat-i-Ahmadi*, supplement, edited by Nawab Ali (Baroda, 1927-30), pp.18-19).
7. *Baburnama,* pp.486-87.
8. Anthony Welch, op.cit., in James L. Wsetcoat Jr. and Joachim Wols – Bulmahn, (ed.), *Mughal Gardens: Sources places,* p.89.
9. *Baburnama,* pp.580,581,606-7,683; Sylvia Crown, op.cit., pp.35, 74.
10. Irfan Habib, *Agrarian,* p.28.
11. Iqtidar Hussain Siddiqui, op.cit., pp. 64, 68-70. He described a large number of wells were constructed not only by Imperial Sultans but also by the regional Sultans of Gujarat and Malwa etc.
12. *Baburnama,* pp.532-33.
13. Ibid, 487; Irfan Habib, *Agrarian,* p.28. for the mechanism of this device see *Baburnama,* p.487.
14. Iqtidar hussain siddiqui, op.cit., pp. 66 and note.

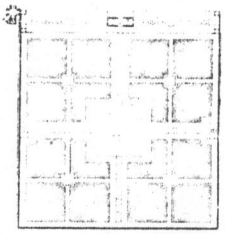

Plate No. 1: A Simple Water Plan of the *Chaharbagh* garden (Hayat Bakesh Garden, Red Foart), Ebba Koch

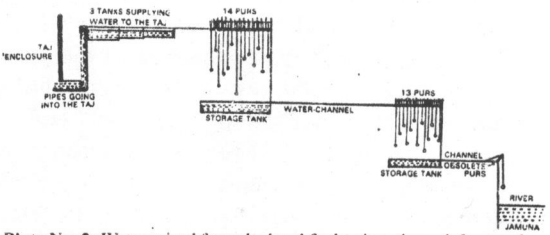

Plate No. 2: Water raised from the level fo the river through 3 sets of *pur* (Taj Mahal Garden) Elizabeth B. Maynihan, p.133

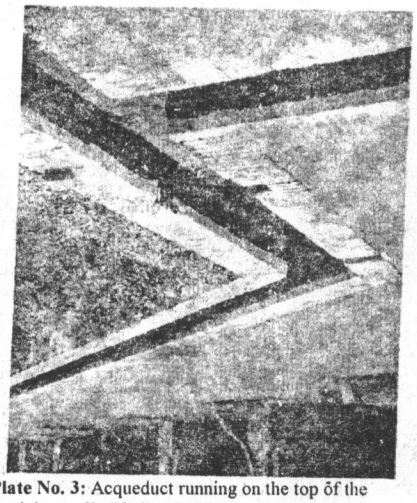

Plate No. 3: Acqueduct running on the top of the rataining wall. (Shahamar Garden, Lahore) Sylvia Crown et al, p.31.

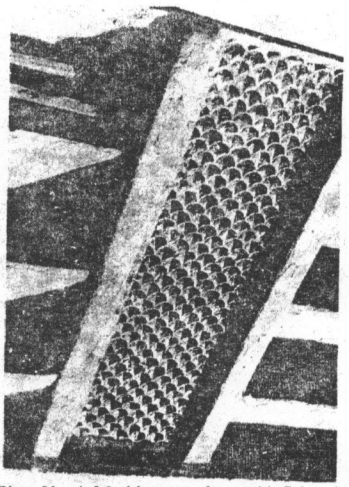

Plate No. 4: Marble waterchute with fishscale pattern (*mahipusht*) Elizabeth B. Maynihan, p.63

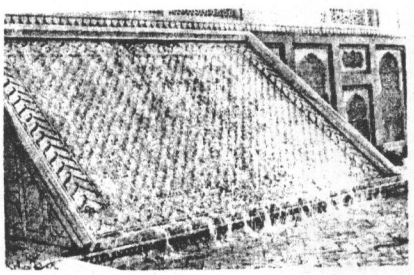

Plate No. 5: Rippling waterchute with niches (Shahamar Garden, Lahore) Elizabeth B. Maynihan, p.143

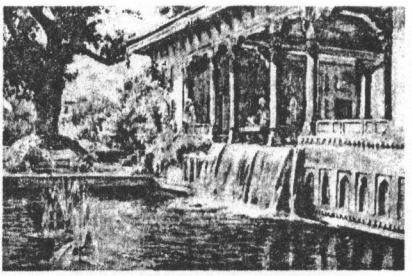

Plate No. 6: Black marble floating throne of the emperor in Diwan-i-am (Shahamar Garden, Kashmir) from a water colour by Stuart Villiers p. 162

15. This device was also known as *arhat* or *rahat* equivalent to Arabic *saqia*. *Saqia* was its Arabic name equivalent to English Persian wheel and *Charakh* was its Persian name equivalent to Arabic *saqia* (Iqtidar hussain siddiqui. op.cit., p.65)
16. Irfan Habib, *Agrarian*, p.28; *Baburnama*, p.486. There are ongoing debate among the scholars over the time period and the area of the use of Persian wheel (cf. Irfan Habib, *Agrarian*, p.28 and Iqtidar hussain siddiqui, op.cit., pp. 63-65). Undoubtedly Akbar made certain improvements by inventing pin drum gearing which enabled water to be lifted from distant lowering places (Irfan Habib, 'Akbar and Technology' in *Social Scientist*, Vol. 20, No. 9/10 (Sep. - Oct., 1992), p.8). For the mechanism of Persian Wheel see also *Baburnama*, p.486; Abul Fazl, *Ain-i Akbari*, ed. Blockman, (Calclutta, 1866-77). vol.,I, p. 199; Iqtidar hussain siddiqui, op.cit., pp. 63-65.
17. Irfan Habib, *Medieval India: The Study of Civilization*, (New Delhi, 2007), p.202
18. Moynihan, *Paradise as a Garden*, p.102
19. Neeru Mishra and Tanay Mishra, *The Garden Tomb of Humayun-An Abode in Paradise*, (New Delhi, 2003), pp.114, 120; Sylvia Crown, op.cit., pp.31, 35; Irfan Habib, op.cit., in James L. Wsetcoat Jr. and Joachim Wols – Bulmahn, (ed.), *Mughal Gardens: Sources places*, p. 133. Elizabeth B. Moynihan 'The lotus Garden Place of Zahir Al-Din Muhammad Babur', Vol. V *Muqarnas*, (1988), p.141; R.Nath, 'Bagh-i- Gul Afshan of Babur at Agra', in *Indo Iranica* 23(iii), p.20
20. Firozshah's canal was repaired by Akbar but was again silted up..Shah Jahan decided to reopen it from its mouth Khizrabad down to Safedon and from there dig a new channel (the canal), nearly 80 miles in length for the use of his new city Shahjahanabad. Ali Mardan Khan's name is generally associated with this canal but his name is given only in the later traditions. cf. Salih Kanbu, *Amal-i- Salih*, 4 volms,(Calcutta, 1912-46), vol. III, p.29; Syed Ahmad Khan, *Aasar-us-Sanadid*, ed.,Tanveer Ahmad Alvi, Urdu Academy, (New Delhi, 2011), pp.135-36;Irfan Habib, *Agrarian*, pp.33-34.
21. *Amal-i- Salih*,III, p.26; *Aasar-us-Sanadid*, pp.123, 127, 131, 135-36; Bernier, Francoise, *Travels in the Mughal Empire, 1656-1668, tr. Archibold constable*, (New Delhi, 1983) (reprint), p257; Manucci, Nicolao, *Mogul India (1653-1708) or Storia do Mogor*, transl. W. Irvine, 4 vols. (Calcutta, 1965-67), I, p.184, II,p.463; Zafar Hasan, *Monuments of Delhi: Lasting Splendour of the Great Mughals and Others*, (New Delhi, 1997), vol. I, p.21-22, 156-57; Ebba Koch, 'Mughal Palace Gardens from Babur to Shah Jahan (1526-1648)' in *Muqarnas*, Vol. 14 (1997), p.153; Ebba Koch, *Mughal Architecture, an Outline of its History and Development,1526-1858*,(Munich, 1991), *p.*111. This canal is mentioned in the inscription of the khwabgah, termed as *nhr-i-Athar* (pure canal) but *nahr-i-bahisht* probably was meant (Zafar Hasan, *Monuments*, pp.16, 21)
22. Bernier, p.396; Irfan Habib, *Agrarian*, p.36.
23. Abdul Hamid Lahori, *Padshahnama*, ed.,Kabir Al-Din Ahmad, Abd Al-Rahman and W.N. Lees, (Calcutta, 1866-72), vol. II, pt.ii, p.24; Syed Muhammad Latif, *Lahore: Its History Architectural Remains and Antiquities*,(Lahore, 1892) ,pp.55,142,253; Muhammad Ishtiyaq Khan, *Shalamar:The Glory that was*, published by the department of Archaeology and Museum, Ministry of Culture, Archaeology, Sports and Tourism, Government of Pakistan, Karachi.
24. Moynihan, *Paradise as a Garden*, p.100.
25. Irfan Habib, *Agrarian*, p.39.
26. Pir Ghulam Hussain Koyahami, *Tarikh*-i-*Hasan*, ed. Sahibzada Hasan Shah, (Srinagar, 1954), Urdu tr. By Shams-ud-din, *Shams-ut-Tawarikh*, (Srinagar, 2003), pp.149-50
27. Ibid, pp.302-07.
28. Jahangir, *Tuzuk-I Jahangiri*,ed., Syed Ahmad, (Ghazipur and Aligarh, 1863-64), p.347; *Padshahnama*, II, pt.ii, 24-25.
29. *Tarikh-i-Hasan*, p.146.
30. Ibid, pp. 292-97.
31. Moynihan, *Paradise as a Garden*, p.100.
32. Ibid; Sylvia Crown, op.cit, pp.17, 20.
33. Neeru Mishra, op.cit., p. 108. Apart from the symbolic features of Mughal gardens from the water point of view there were other symbols of Mughal gardens with the Paradise like the symbol of chenar tree, other fruit trees and flower beds etc..Villeirs Stuart has given her own version of symbology with Hindu culture. See Villiers Stuart, *Gardens of the Great Moughals*, (London, 1913),, pp.20, 46-47
34. Neeru Mishra, op.cit., p. 116.
35. Muhammad Salih Kanbu, *Bahar-i-Sukhan*, fol.119 as cited in Abdul Rahman, 'Garden Types in Mughal Lahore According to Early Seventeenth Century and Visual Sources' in *Gardens in theTime of the Great Muslim Empires: Theory and Design*, ed. Attilio Petruccioli, *Muqarnas* Supplements, vol. 7 (Leiden: EJ. Brill, 1997) p.164.
36. *Baburnama, pp.*486-87.
37. Syed Ali Nadim Rizavi, op.cit., Irfan Habib, *A Shared Heritage*, p.130.

38. Ebba Koch, *The Complete Tajmahal and the Riverfront gardens of Agra,* (New Delhi, 2006-7), p.24.
39. Ebba Koch, *The Complete Tajmahal,* pp.23, 29, 32, 69. For the details of Angoori Bagh at Agra Fort and Mahtab Bagh at Red Fort see *Amal-i-Salih,* II, pp.6-7, III, pp.22-36; *Padshahnama,* I, pt.ii, pp. 223-25, 240-41; *Aasar-us Sanadid,* pp. 127, 128, 131; Moynihan, *Paradise as a Garden,* pp.136-38; Ebba Koch, op.cit., in *Muqarnas,* Vol. 14 (1997), pp.148, 149, 153-54, 156, Ebba Koch, ' The Mughal Waterfront Garden', Ebba Koch, 'The Mughal Waterfront Garden', in *Gardens in theTime of the Great Muslim Empires: Theory and Design,* ed. AttilioPetruccioli, *Muqarnas* Supplements, vol. 7 (Leiden: EJ. Brill, 1997) p.144.
40. James Dickie, op.cit., *Muqarnas,* p.113.
41. Syed Muhammad Latif, op.cit. , p.247.
42. Ebba Koch, *The Complete Tajmahal,* p.57; Elizabeth B. Moynihan 'The Lotus Garden Palace of Zahir al-Din Muhammad Babur', in *Muqarnas,* Vol. 5 (1988), p.141; Mohammad Azher Ansari, 'Palace and Gardens of the Mughals', in *Islamic Culture,* vol.33, (1959), p.68.
43. Syed Muhammad Latif, op.cit, pp.140-41, 142; Muhammad Ishtiyaq Khan, op.cit. For the details of the Shalamar garden at Lahore See also Mohammad Shafi, 'The Shalimar Garden of Lahore', in *Islamic Culture,* vol, I, (1927), pp. 58-66; HIS. Kanwar, "Origin and Evolution of the Design of the chaharbagh Garden', *Islamic Culture,* V. 48, (1974), pp.105-117; Mohammad Azher Ansari, op.cit., *Islamic Culture,* pp.50-72; James Dickie, op.cit., pp. 128-137; Moynihan, *Paradise as a Garden,* pp.141-45.
44. Bernier, pp.398-401, 413; Sylvia Crown, op.cit., pp.38, 94, 130; Moynihan, *Paradise as a Garden,* pp. 127-28; GMD Sufi, *Kashir: Being a History of Kashmir from the Earliest time to our own,* (Lucknow, 1974), vol. II, pp.515-537; Sylvia Crown, op.cit., pp.38, 94, 130; Moynihan, *Paradise as a Garden,* pp.127; Mohammad Azher Ansari, op.cit., *Islamic Culture,* pp.69-71.
45. R Nath, op.cit, *Indo Iranica,* pp.18-19; Neeru Mishra, op.cit, pp.107-113.
46. Sylvia Crown, op.cit., p.50.
47. Ebba Koch, *The Complete Tajmahal,* p.42; Moynihan, *Paradise as a Garden,* pp. 105-6, 114; Neeru Mishra, op.cit, pp.113-14, 115; Salim Javed, 'Mahtab Bagh: An Imperial Mughal Garden at Agra',*PIHC,* Kannur session (2009), pp.1086, 1087.
48. R Nath, op.cit., *Indo Iranica,* pp.19-20.
49. In Persian it was called pigeon-breast while in India where the water-chute was called as *chaadar* and the pattern is called fish scale (Moynihan, *Paradise as a Garden,* p.61)
50. Neeru Mishra, op.cit, p.107; Syed Ali Nadim Rizavi, op.cit., in ed., Irfan Habib, *A Shared Heritage,* p.130In a survey of the garden of Fatehpur Sikri conducted by AMU, Aligarh an stone *abshar* with fishscale design was excavated (Syed Ali Nadim Rizavi, 'Exploring the Mughal, *PIHC,* p.897).
51. Neeru Mishra, op.cit, p.115; Syed Ali Nadim Rizavi, op.cit., in ed., Irfan Habib, *A Shared Heritage,*p.130; Syed Ali Nadim Rizavi, 'Exploring the Mughal, *PIHC,* pp.896, 900; Zafar Hasan, op.cit., vol,II. P.117; III, p.34; Muhammad Ishtiyaq Khan, op.cit.. Syed Muhammad Latif, op.cit.,pp.141,142, 247; Sylvia Crown, op.cit., pp.108, 116, 152, 153, 166; Moynihan, *Paradise as a Garden,* pp.106, 112, 125, 138,143
52. Muhammad Salih Kanbu, *Bahar-i-Sukhan,* fol.121-22 as cited in Abdul Rahman, op.cit., *Muqarnas,* p.165.
53. Neeru Mishra, op.cit, pp.107-08.
54. R Nath, op.cit., *Indo Iranica,*p.19.
55. James Dickie, op.cit., *Muqarnas,* p.130.
56. Jahangir used to sit in his black marble throne over the water in the Shalimar Bagh of Kashmir (Sylvia Crown, op.cit., p.98). In the same manner emperor Shahjahan's throne was built of white marble in the Shalamar garden of Lahore (Sylvia Crown, op.cit.,p.152; Moynihan, *Paradise as a Garden,* pp.124, 143; James Dickie, op.cit., *Muqarnas,* p.135; Muhammad Ishtiyaq Khan, op.cit.). A number of such types of marble thrones placed across the water Nishat bagh at Kashmir (Sylvia Crown, op.cit.,pp. 116).
57. Sikandar bin Manjhu, Mirat-i Sikandari, ed. S. C. Misra, Baroda, 1961, pp. 139-40.
58. Sylvia Crown, op.cit., p.45.
59. Muhammad Ishtiyaq Khan, op.cit.; Neeru Mishra, op.cit., p.96.
60. HIS. Kanwar, op.cit, in *Islamic Culture,* p.115; Mohammad Azher Ansari, op.cit., in *Islamic Culture,* p.70; Salim Javed, 'op.cit, *PIHC,* p. 1086 ; Villiers Stuart, op.cit.,p.145; Sylvia Crown, op.cit., p.136; Moynihan, *Paradise as a Garden,* p.143.
61. *Tarikh-i-Hasan,* pp. 297,299; *Aasar-us-Sanadid,* p.124; Sylvia Crown, op.cit., pp.116,152, 153,160; Moynihan, *Paradise as a Garden,* p.124.
62. Ibid, pp.142-43.
63. Ibid, pp.112, 114, 124, 142, 147; op.cit., pp.44-45; Neeru Mishra, op.cit., p.114.
64. James Dickie, op.cit., *Muqarnas,* p.130.
65. Ibid, pp.112, 114, 124, 142, 147; op.cit., pp.44-45; Neeru Mishra, op.cit., p.114.