IV - RESULTS AND DISCUSSIONS

IV - a) Design appropriate garden for kindergarten form functional , environmental ,and aesthetic aspects : -

1 - Determine the educational aspects : -

The questionnaire analysis indicated that the average percentage of educational aspects , (CONCEPTS , SKILLS and VALUES) that children can learn in the garden are shown in Fig.(23) . The educational professors in Bologna and Alexandria university determined (48) Concepts , Skills and Values that children can learn in the garden . Concerning the concepts , the results of the analysis of the questionnaire indicated that (I-a) Scientific concepts that children can learn in the garden , are development , texture , color , smell , sound , light , shade , temperature , float . The color concept had the highest average of importance as 100 % for learning in the garden followed by the development concept 94 % while the smell , texture , shade , sound , temperature , light and the float concepts were (88.9 % , 83.3 % , 77.8 % , 77.8 % , 72.2 % ,72.2 % , 66.7 %) respectively .

As for (I-b) the Environmental concepts through which children can learn in the garden , were plants , animals , - air , water , rain , sun , snow , earth , food , life , death . Plants , life and food concepts had the highest average as100 % for learning in the garden . On the other hand, the earth , water , air , rain , sun , animals , snow and the death , concept was (94.4 % , 88.9 % , 88.9 % , 83.3 % , 77.8 % , 77.8 % , 50% , 50 %) respectively for learning in the garden .

Also (I-c) the Mathematical concepts , which were determined, as 1- formal shape , and 2- volume . Volume concept (94 .4%) was higher as compared to the formal shape concept (78 %) for learning in the garden .

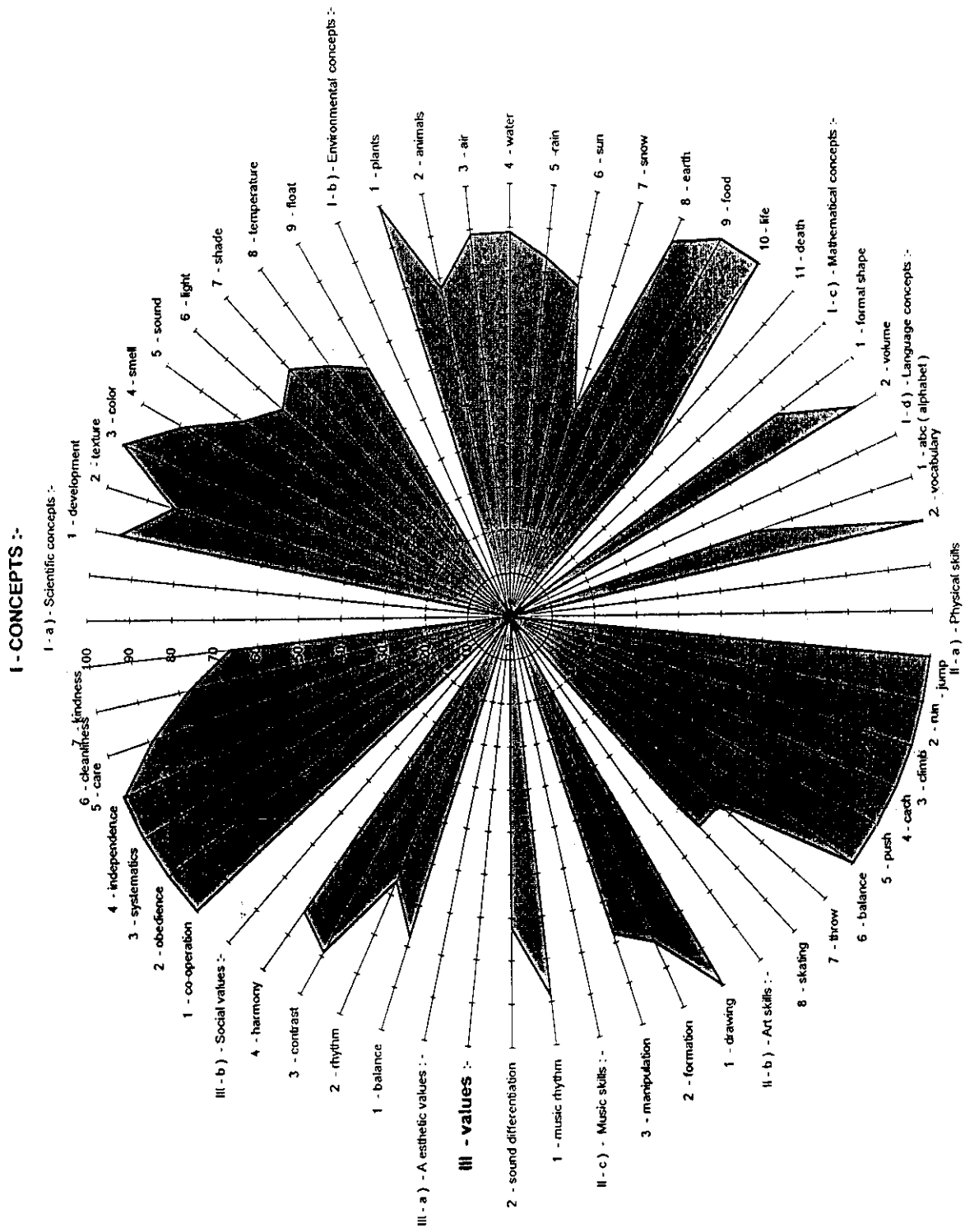


Figure 23 – a : Average percentage of concepts, skills and values which children can learn in the garden

I - CONCEPTS :-

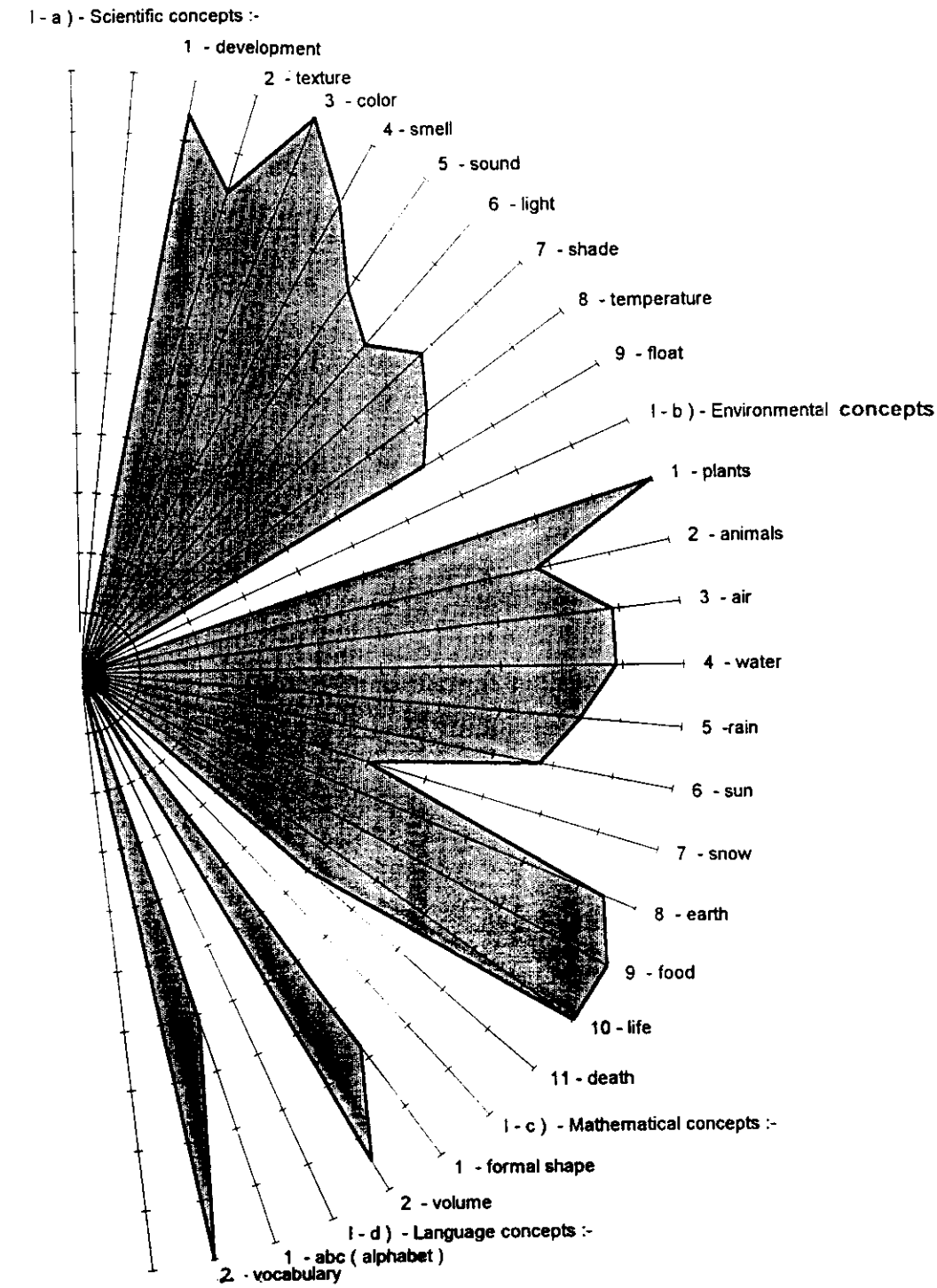


Figure 23 - b : Average percentage of concepts, which children can learn in the garden

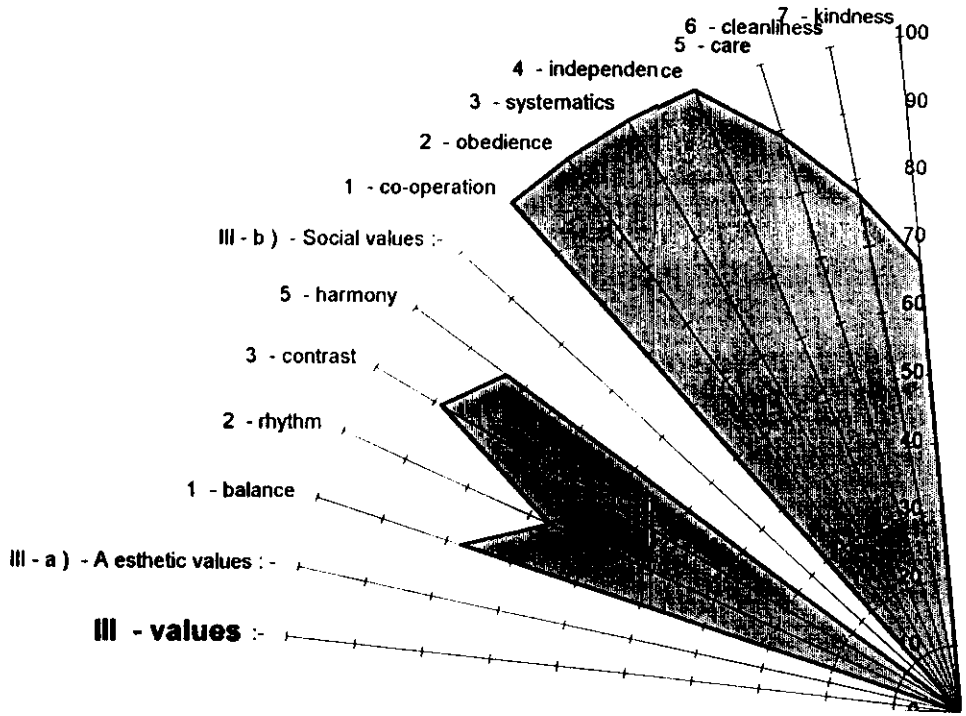


Figure 23 - c : Average percentage of values which children can learn in the garden

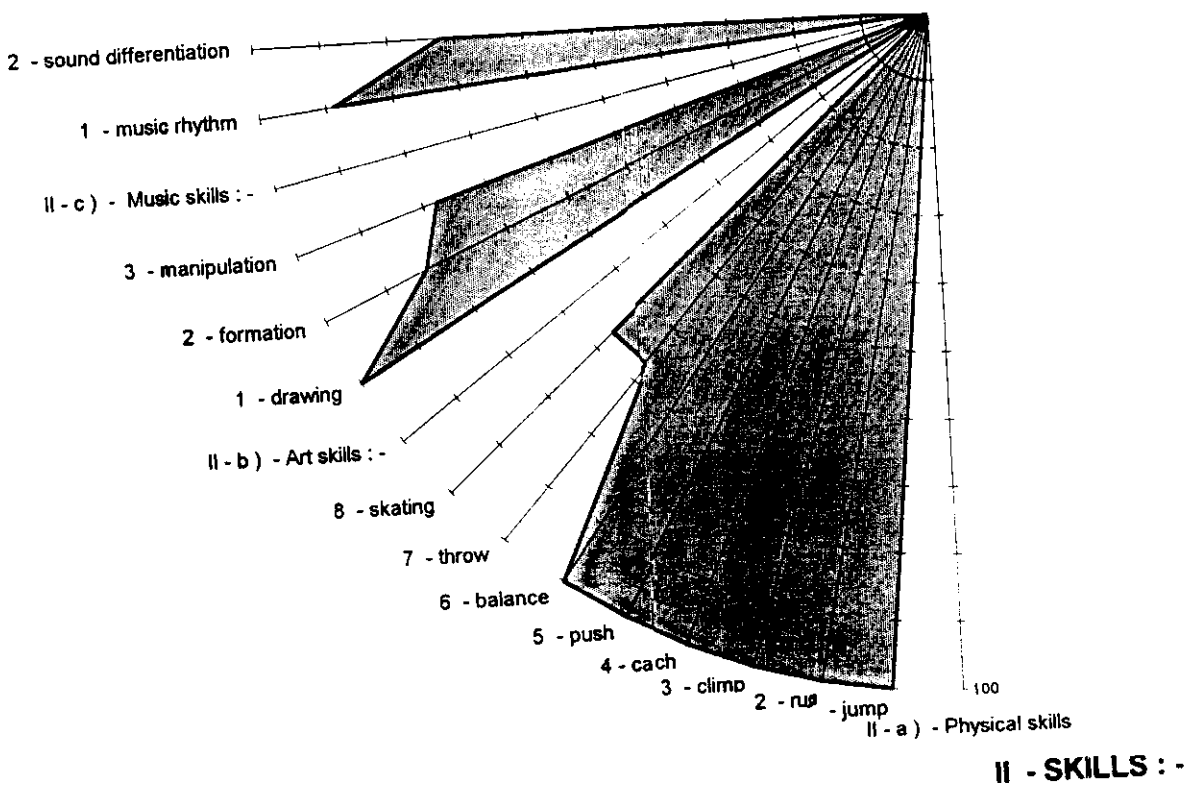


Figure 23_d : Average percentage of skills which children can learn in the garden

For (I- d) the Language concepts the results indicated that vocabulary concepts is more important (100 %), than ABC (alphabet) concept (61%) for learning in the garden .

The questionnaire analysis also indicted , (II) the skills that children can learn in the garden . Three kinds of skills ,children can learn in the garden , (II-a) Physicals skills , (II- b) Art skills , and (II - c) Music skills .

The physical skills are more important specially run , jump, climb , catch , push , and balance skill (100 %) . Where as throw and skating skill were the lowest physical skills in importance (67 %) . Drawing , formation and manipulation were detrmined as the Art skills, which children can learn them in the garden . Drawing skill is more important than all others (100 %) . Also , the Musical skills (II - c) were determined and Music rhythm skill , was (89. %) as compared to (72 %) for sound differentiation skill .

Also, the Values were determined , and two kinds of Values , children can learn in the garden , (III - a) Aesthetic values , and (III - b) Social values . The results indicated that contrast value had the greatest importance (89 %) , than harmony , balance , and rhythm value (83.3 % , 78 % , 67 %) respectively for the Aesthetic values .

Moreover the Social values were determined and co-operation , obedience and systematic value (100 %) were the most important social values , while kindness value was (67 %) , was least importance to learn in the garden .

Generally the educational professors gave more importance for (I - b) Environmental concepts , (I - a) Scientific concepts and (II - a) Physical skills that children can learn in the garden than others .The result of the questionnaire gave good information about the educational aspects , (Concepts , Skills and Values) which children can learn in the garden . Children in kindergarten learn most readily from first - hand expriences of high inerest . One view of kindergarten , children's Knowldgment base is that it is structured from bits and pieces of isolated information that may have been acquired over several episodes (Chi & Ceci , 1987) .

These bites of information may or may not be coordinated into a hierarchial system such as noting that weed , a rose , and a tree are all plants . This views is consistent with Piaget's (1952) observation that the ability to classify and organize information is a skill that is underdevloped in very young children . This view is also consistent with the observation that children remember a little about many topics which may be organized in ways unique to the indivudual . Yet , youngester generalize scripts or patterns based on previous experiences that cause them to expect certian events and behaviors in the future (Nelson, 1989) . When children encounter expected or familiar objects or events they are able to elabrate or modify current ideas . They gradually construct a more accurate , and more complex concept as they encounter and incorporate new experiences . Information processing theory is useful in examining specific cocepts and how they are acquired , giving the structures of thinking characteristic of preoperational children (Siegler , 1983) .

2 - Determine the components of kindergarten gardens : -

The components of kindergarten gardens , which were included , Fig. (24) indicated that there were (13) kinds of material and play equipment, Table (5) . In all gardens of kindergarten , sand material was found as 100 % . Sand was in two phases :-

a)- Sand bit is a layer into the garden surface with an area approximeatly 5 - 16 Sq. m . filled with sand , with minimum depth of 25 cm .

b) - Sand box is a woody box above the surface of the garden with an average of (6- 12 Sq. m) and 20 - 40 cm depth .

According to the survey, water play equipment were found in all kindergarten , as Water playtables, water pump and pool , Fig. (25) .

The survey showed that all kindergarten gardens have play hut equipment in different types. These types were tower hut , play hut, play house and shopping center Fig. (26) .

Kindergarten gardens under the survey have the bridge as (67 %), only in kindergarten garden No. 2, 4, 6 , and 9 . Bridges were found in different types , suspension brides and tower bridges , Fig. (27) .

Swings equipment were founded in all kindergarten gardens, in either suspension swings or seesaw swings , Fig.(28) .

Also , slides were found in all kindergarten gardens , in either free standing slide or attached to play structure , Fig. (29) .

Music play equipment ,were found only in kindergarten garden 2 , 4 , 6 and 9 .The music play equipment have two types , xylophone and Alphabet / Music board , Fig . (30) .

Except kindergarten garden No. 1 , 3 , 5 and 8 , the others have vehicles with (56 %) . These vehicles have two types , tricycle and children cars , Fig. (31) .

Table 5 : Percentage of materials and play equipment in kindergarten gardens :

Materials and play equipment	%
1- Sand	100
2 - Water play equipment	100
3 - Play huts	100
4 - Bridges	67
5 - Swings	100
6 - Slides	100
7 - Music play equipment	44
8 - Vehicles	56
9 - Spring play equipment	100
10 - Play structures	100
11 - Ball game equipment	44
12 - Gymnastic play equipment	44
13 - Tunnel play equipm	44

Springs play equipment were found in all kindergarten gardens in different shapes , as animals (horse , sheep , elephant , goose , etc.) and in shape of flower , Fig .(32) .

Play structures equipment were found in all kindergarten gardens in different shapes and different units , Fig . (33) .

Ball game equipment were found under this survey by (44 %) , only in kindergarten garden 2, 6 , 7 , and 9 . Ball game equipment were found in basket ball and ball cone type .

Gymnastic play equipment were found in kindergarten 2, 4 , 6 , and 9 (44 %) , either in single case , as ladder wall or attached to play structures equipment Fig. (34) .

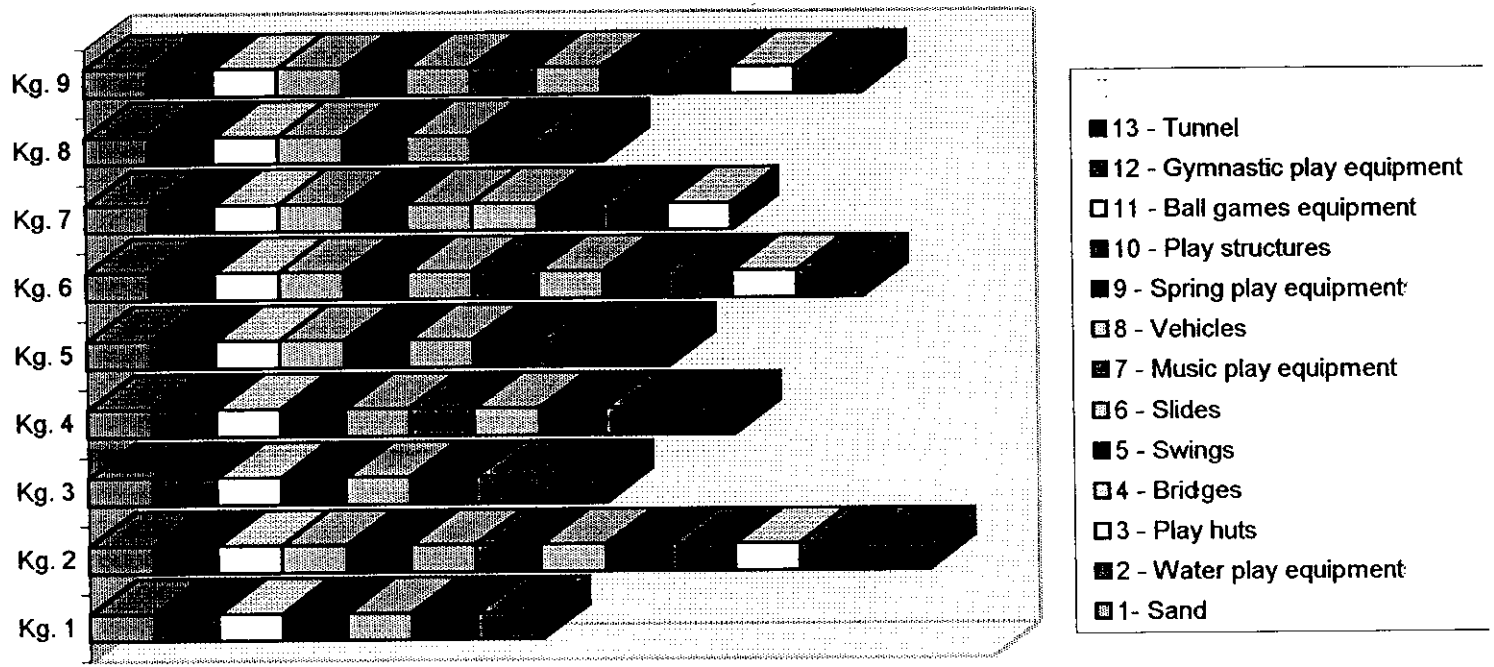


Figure 24: The materials and play equipment in kindergarten gardens.

Tunnel was found in two types , in kindergarten garden 2 , 3 , 4, and 5 with (44 %) . Tunnel types were tunnel tube and hill tunnel , Fig. (35) .

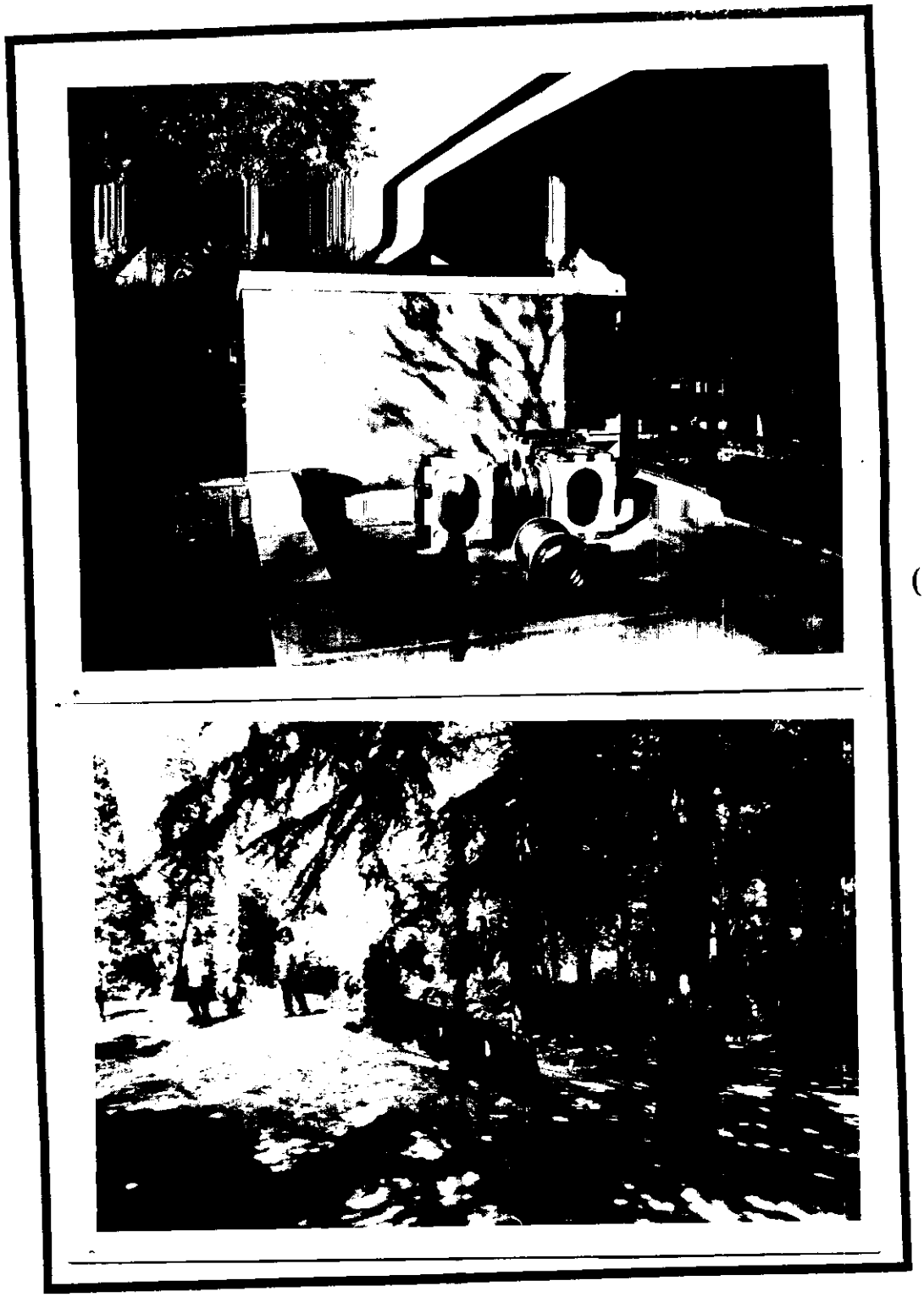
This study indicated that the choosing of materials and play equipment did not depend on any program or basic educational role by designers or educationists in all kindergarten gardens . Also , there were no rules for the setting of the play equipment in the garden .

Figure 25 : Water feature are the most striking garden element .The sound of falling water or the stillness of a quite reflecting pool captures viewer's attention and draws them to these delightful places in the garden .

(a)

(b)

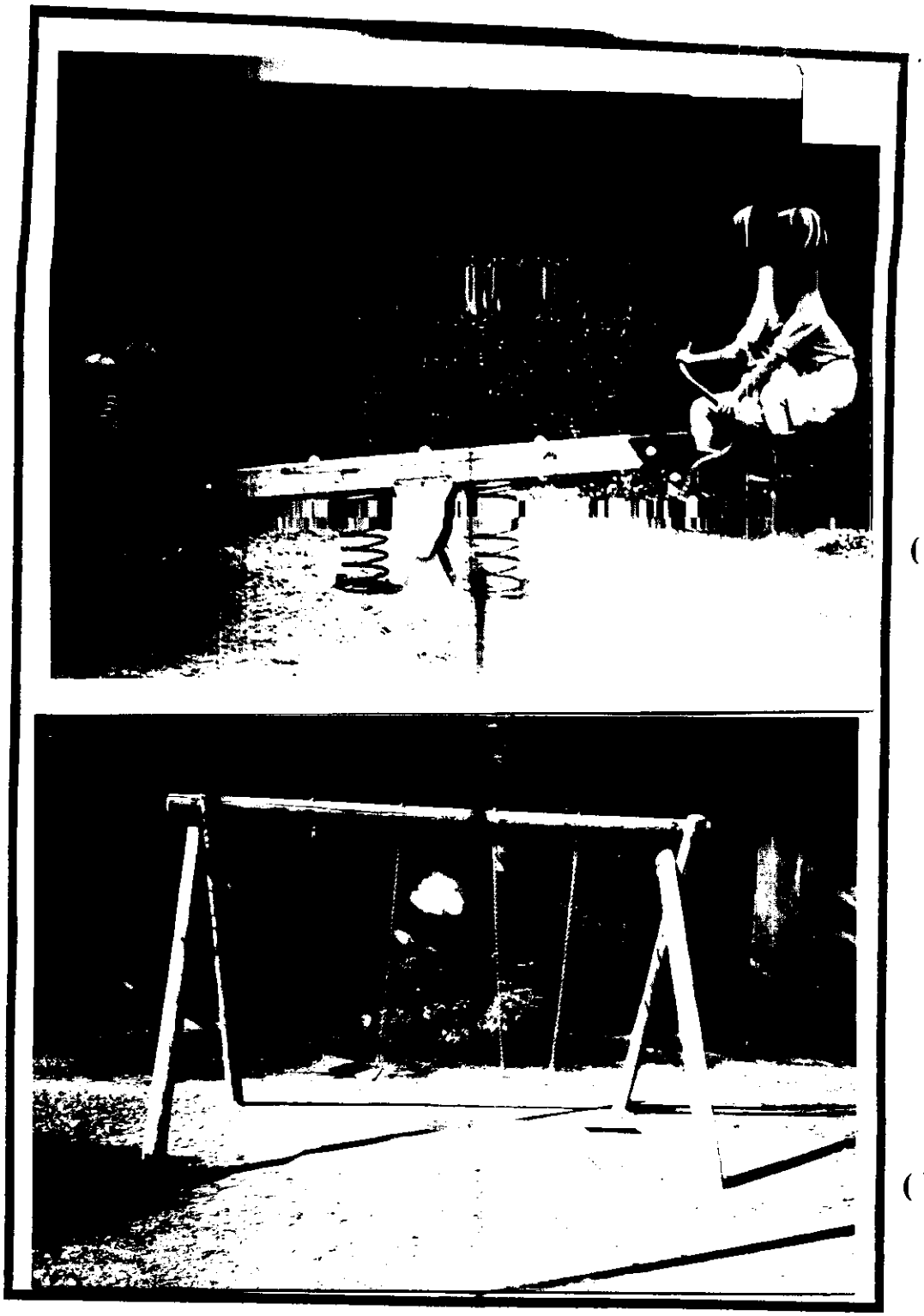
Figure 26 : (a) Trees used to support the Tower hut as one unit in nature form created tree house , providing shade and enjoyment the environment .
(b) Hedges make effective screens for privecy to Play house .



(a)

(b)

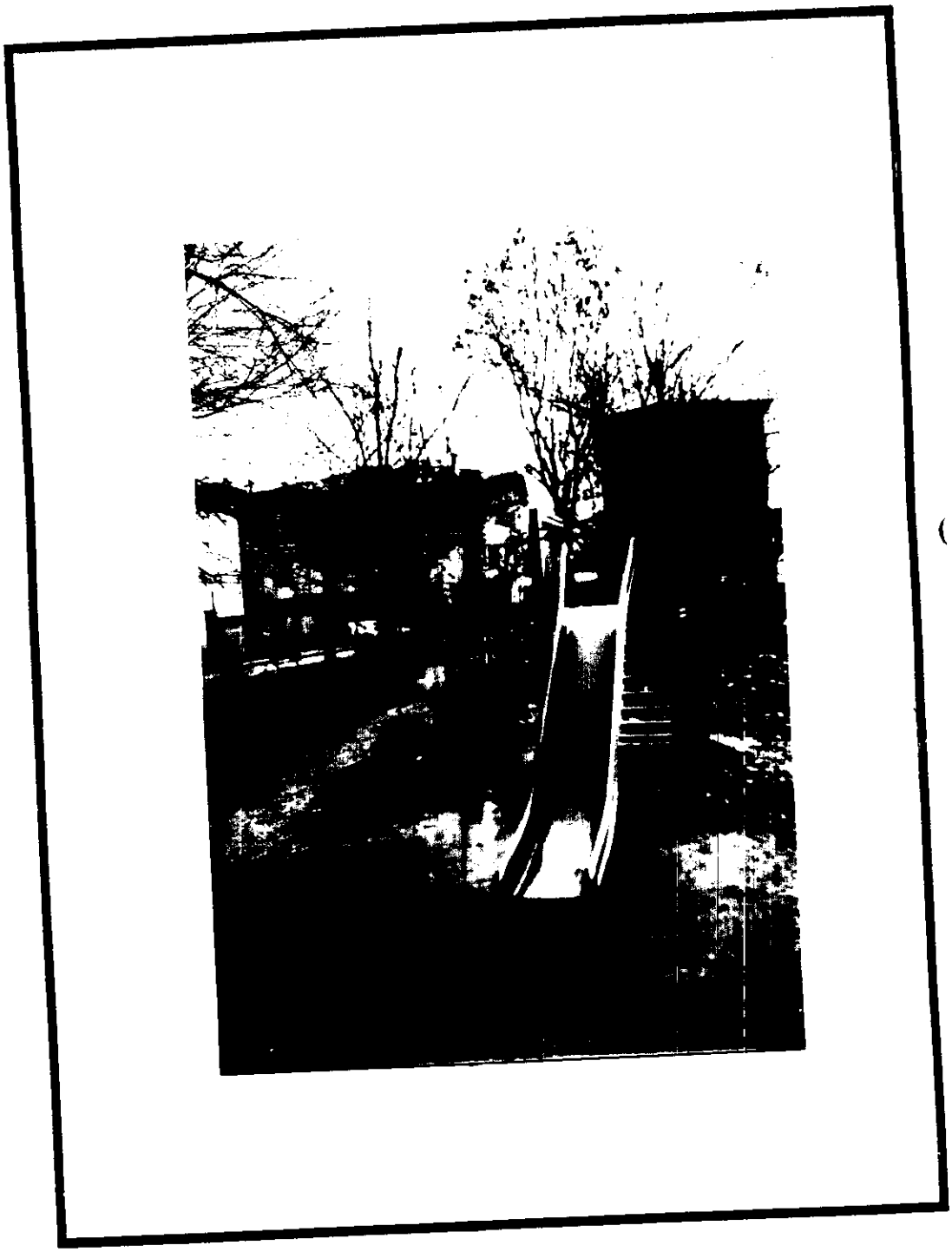
Figure 27 : Trees used to provide shade and tunnel effect is almost created for (a) Suspension bridge and (b) Tower bridge .



(a)

(b)

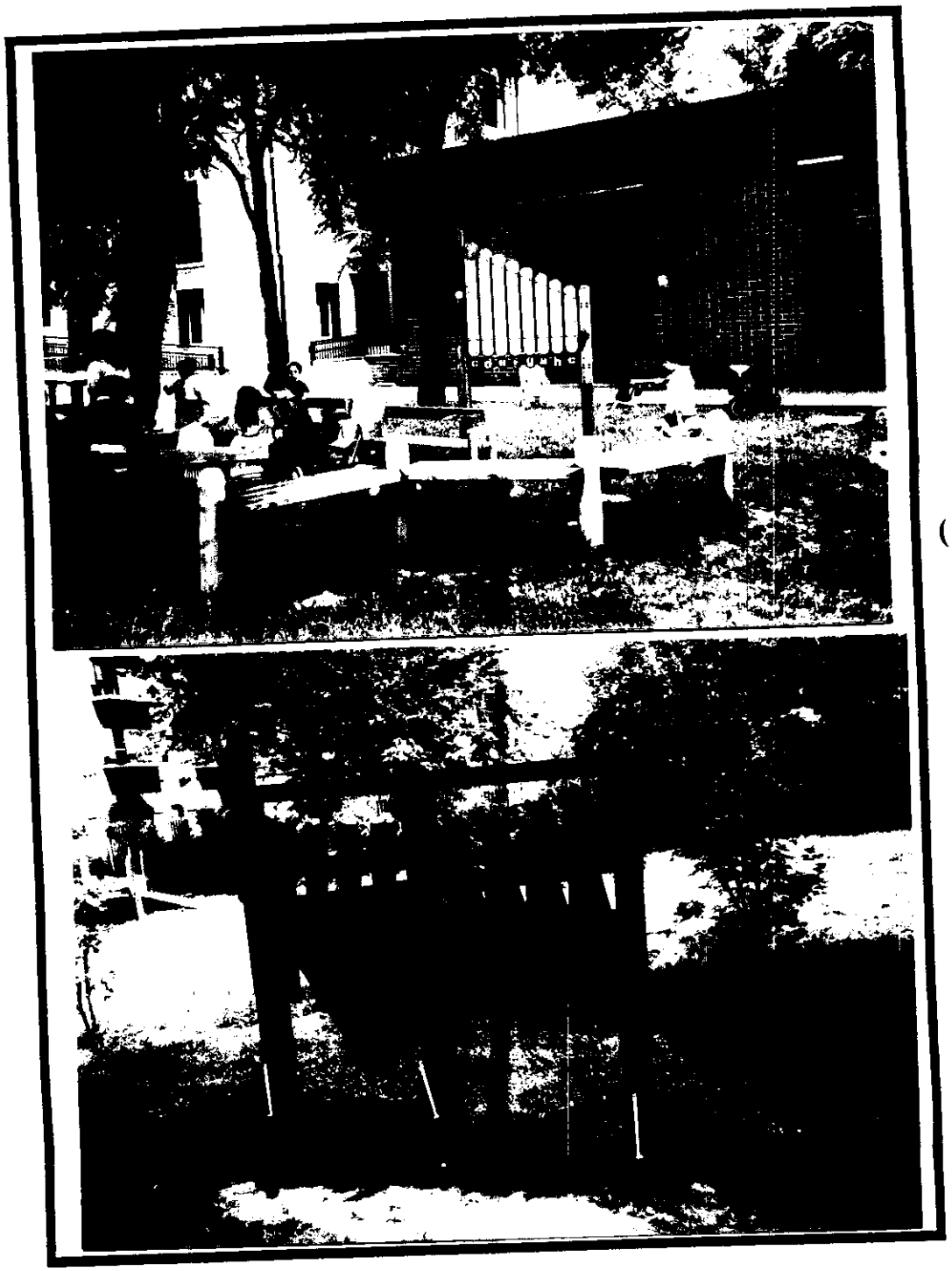
Figure 28 : Lawns is visually inviting serface for play with (a) the Seesaw swing compared to (b) the Suspension swing on elastic tiles and dusty surface .



(a)

(b)

Figure 29 : The dramatic form and branching structure of the trees as a background of (a) the free standing of slide and (b) slide attached with play structure lend an exciting sculptural quality to the landscape .



(a)

(b)

Figure 30 : (a) the Xylophone and (b) Alphabet / Music board were found near the activity rooms in kindergarten gardens .

Figure 31 : The Paved are is essential area for driving tricycle and children's cars in kindergarten gardens .

Figure 32 : The Spring play equipment are very attractive for children in kindergarten gardens .

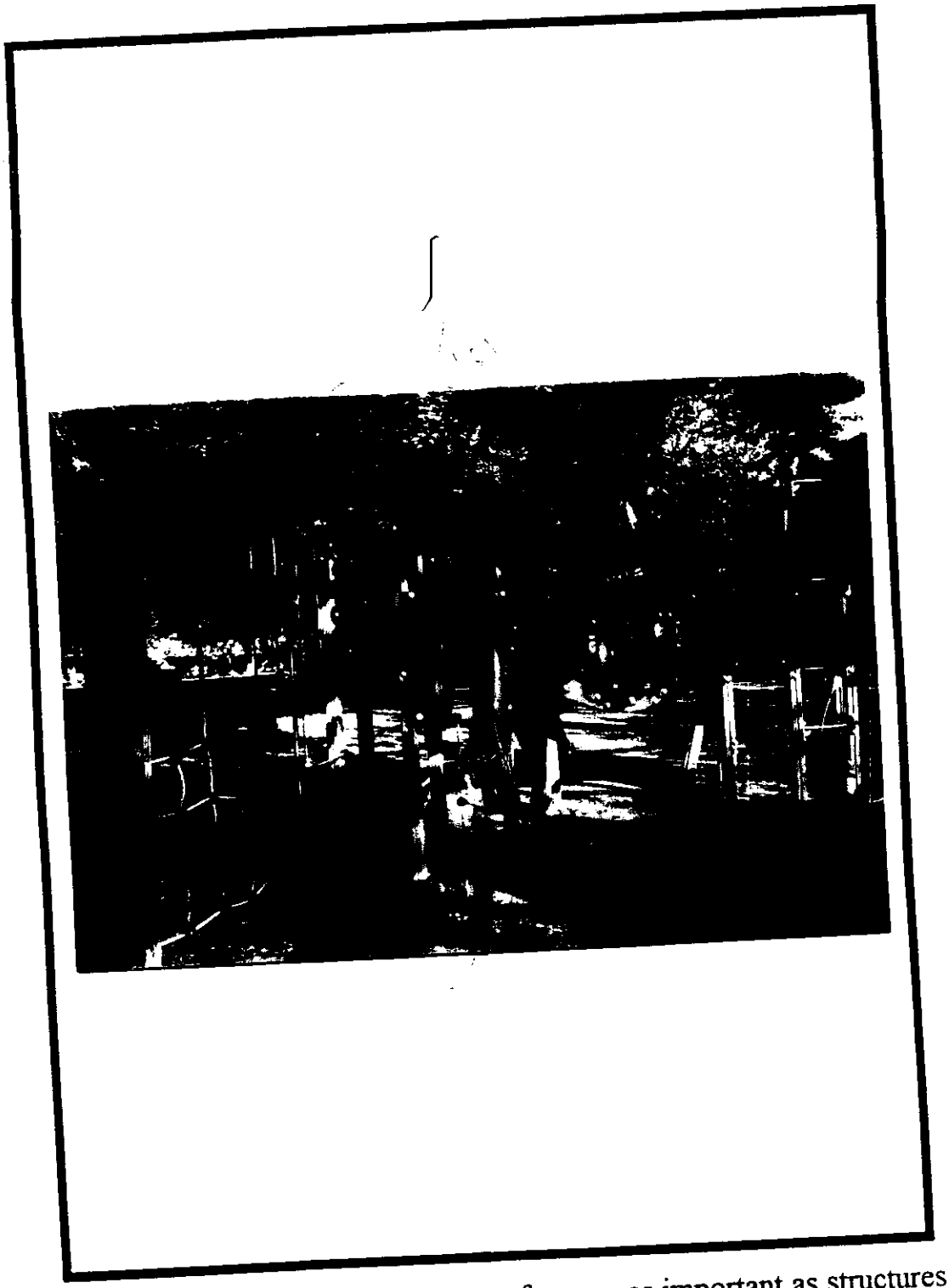


Figure 33 : The surroundings and the surface are as important as structures for play structure equipment .

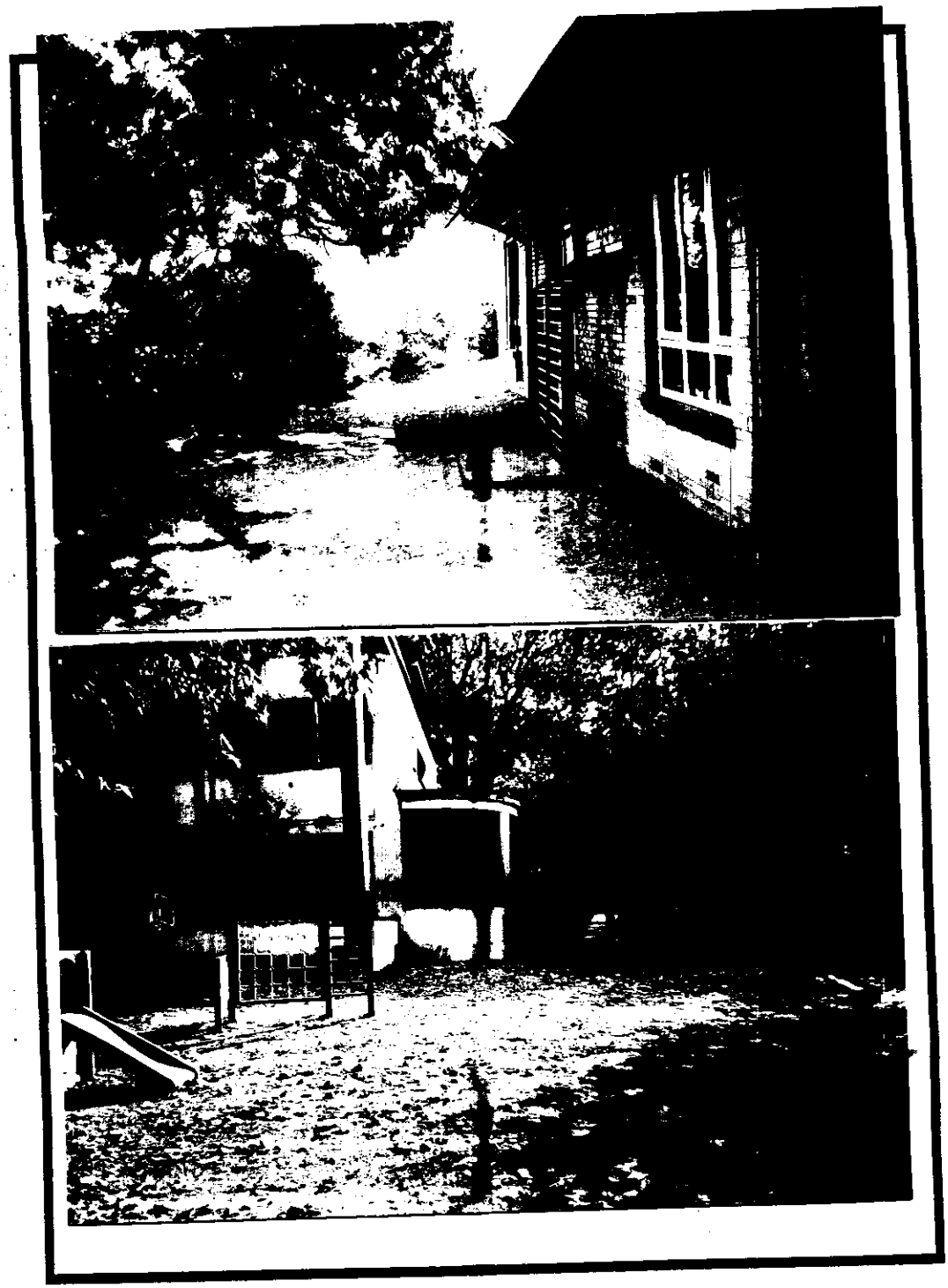


Figure 34 : Ladder wall and Climping net were found in kindergarten gardens as Gymanstic play equipment

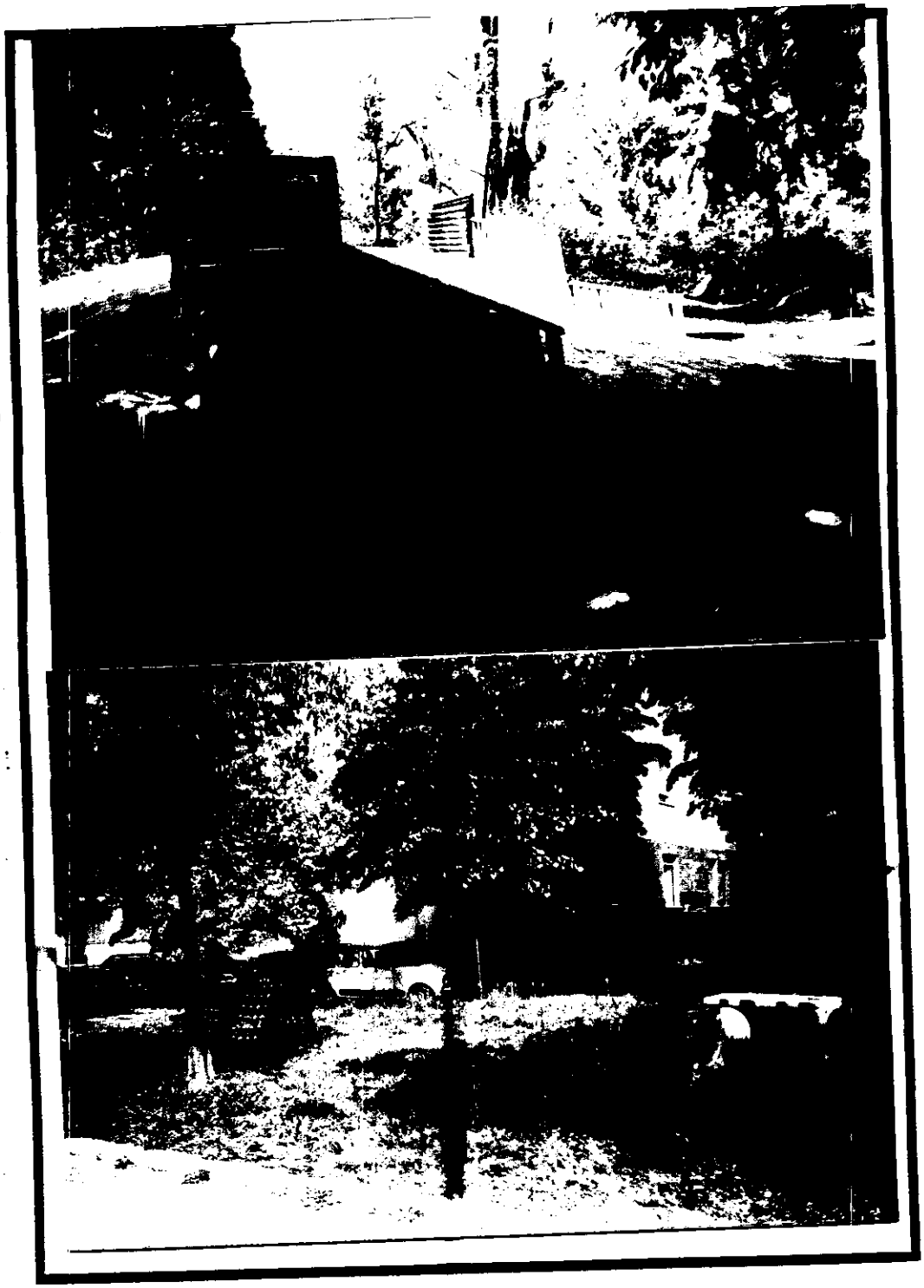


Figure 35 : The types of tunnels Hill tunnel and Tunnel tube very attractive for chlidren as refuge in kindergarten gardens .

3 - Determine children's requirments of materials and play equipmet : -

The result of children behavior with materials and play equipment in kindergarten gardens which are shown in Table (6) and Fig.(36), indicated that (13.2 %)of children play in sand as they were in the garden , Moreover , the highest proportion of children played in sand was (14%) in kindergarten No.2. On the other hand , the least proportion was (12 %) in kindergarten No. 3 .

Children played with swings , in different shapes , comprised (6 %) of the total number of the children . The highest percentage of the this children was (8 %) in kindergarten No. 1 , while Kindergarten No. 4 had the least value (4 %) .

- The investigation showed that (10.4 %) of the children played in different forms of huts , where the highest proportion was found in kindergarten No. 5 (12 %). The least proportion was found in kindergarten garden No. 2 (9 %) .

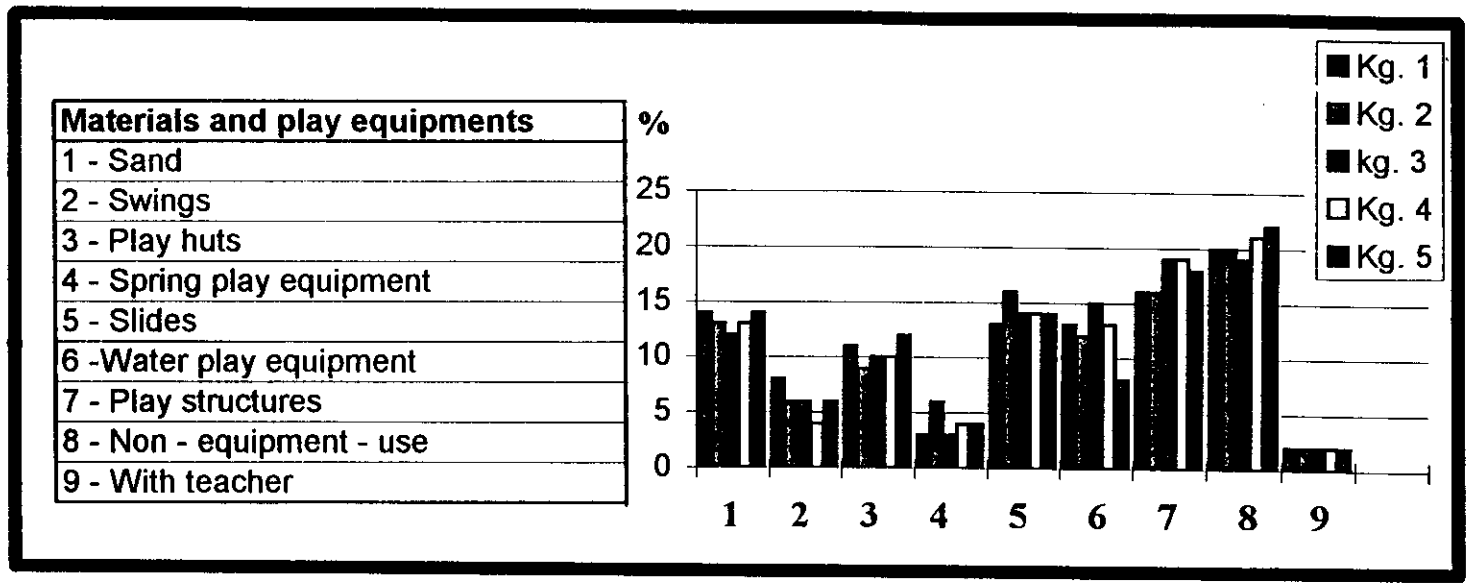
Children played with Slides comprised (14.2 %) of the total number of children . Kindergarten garden No. 2 had the highest value (16 %) , while Kindergarten No. 1 showed the least value (13 %) .

Children played with Water play equipment comprised (12.2 %) of the total number of children .The highest and the lowest percentages as (15 % , 8 %) were found in kindergarten garden No. 3 and , respectively for Water play equipment .

Children played with Structure play equipment were (17.6 %) of the children population . Kindergarten garden No. 3 and 4 showed the highest value (19 %) , while the lowest values was for kindergarten garden No.1 (16 %) .

Children that did not use equipment and materials to play with were found to be (20 .4 %) of the total children . Those children played some other activities like running , jumping and refuge ..etc. The highest

Figure 36 **Average percentage of children's behaviors with materials and play equipment**



proportion was found in kindergarten No. 5 , (22 %) . The least value was in kindergarten garden No. 3 , (19 %) .

Table 6 : Average percentage of children's behaviors with marterials and play equipment : -

Materials and play equipment	Kg.1	Kg .2	Kg.3	Kg.4	Kg.5	Aver.
1- Sand	14	13	12	13	14	13.2
2- Swings	8	6	6	4	6	6
3- Play Huts	11	9	10	10	12	10.4
4- Spring play equipment	3	6	3	4	4	4
5- Slides	13	16	14	14	14	14.2
6- Water play equipment	13	12	15	13	8	12.2
7- Play structurs	16	16	19	19	18	17.6
8- Non - equipment use	20	20	19	21	22	20.4
9- With teacher	2	2	2	2	2	2

It was found that (2 %) of the children in the garden were always accompanying their teachers in all the kindergarten garden under the investigation . This may be attributed to the over care or to mutual sympathy .

The obove study showed the children's requirments of materials and play equipment in kindergarten garden . The plans considered all the aspects mentioned above in the design . This was very important give ideal plans to face the requirements of the children at the age between 3-6 years . The plan basement was very promising to fulfill all aspects pre-studied .

4 -Components that teachers need in the garden : -

When the teachers were asked , to determine the components needed in the garden , they demanded the following aspects Fig. (37) :-

1) - A fence around the garden , to prevent the intruders and animals (dogs), this was demanded by 82 % of the teachers .

2) - An attractive shape for gate to be a sign for the children , was required by 87 % of the teachers ,

3) - Music play equipment for different activities were also required by 67 % of the teachers.

4) - An area of the garden should be planted with vegetable plants .This area was required by 89 % of the teachers .

5) - An appropriate paths in the garden to fit the children and children activities were required by 76 % teachers .

6) - Paved area to do some activities such drawing and car driving , was also required by 71 % of the teachers .

7) - Twenty nine percent of the teachers demanded a sitting area for parents for waiting out classroom .

8) - Flowering plants were required by 92 % of the teachers as they noticed that children are attracted to flowers .

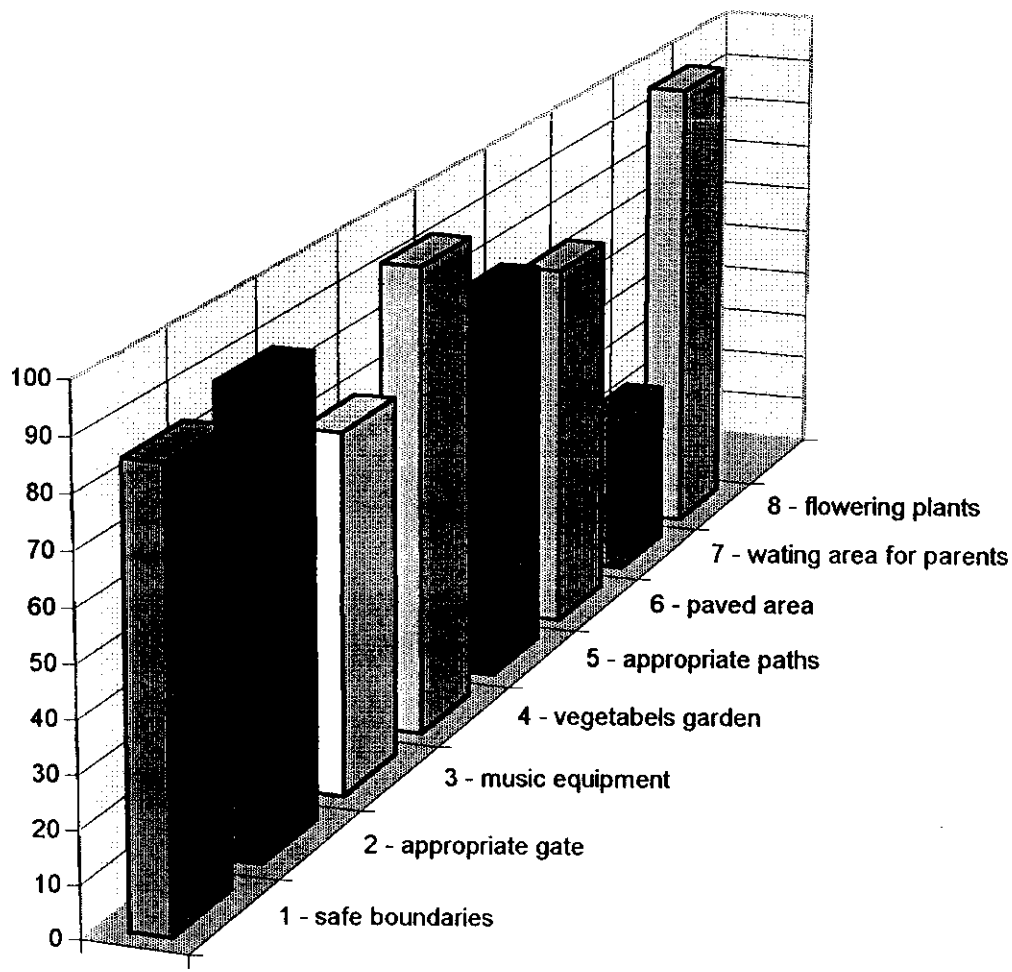


Figure 37 : The components that teachers needed in their garden

Design analysis : -

Design analysis of areas indicated that our , design is characterized by its informal style using curved lines that appeared in the paths . These lines (paths) were useful to control the movement , either visually or physically in their different directions . This type of children's garden is one of a complementary gardens . Two types of children's gardens , the first are independent gardens , which mainly are constructed to provide the children's need only . The second type are the complementary gardens , which are attached to any other type of gardens , such as park, club gardens , house garden and school gardens .

The site analysis (Fig 1-a) indicated that the garden of Bolzani kindergarten, falls in the middle of park and the garden is bordered from the southern side by a street . therefore the eastern and western sides of the design were left opened to the park , framed with wire fence , to provide the feeling of large space extention .The surroundings gave a complete vistus .

The building of Bolzani kindergarten has three entrances . the building was completely attached to the garden through glass doors and windows of activity rooms . The design consisted of seven areas , those areas were created by the curved paths . So , the partitioning of the areas by the paths resulted in preventing any interference between the different activities . Also , the partitioning by the paths resulted in full utilization of all the areas in the garden .

The balance in the design is equivalent , the Vegetables and Fruit garden on right side balance with the Sea garden on the left one of the design . The Rainbow garden area in the design as a focal point with its unique character , when the arrangement of plants similarly to the Rainbow colors acted as emphasis the design .

Young children usually are more sensitive to cold , wind , sun rise and extremes of temperature than the other most adults . On this ground *Carpinus betulus pyramidalis* acted as wind shelter and for screening to provide privacy in the garden . The three climatic factors that affect children comfort

are solar radiation , air movement or wind and humidity .*Carpinus betulus pyramidalis* controlled wind by obstruction , guidance , deflection and filtration . Obstruction with trees , as all other barriers , reduces wind speed by increasing the resistance to wind flow . The most efficient ratio of height to length for wind breaks is according to Robinette , .1972 , 1 : 11.5 .

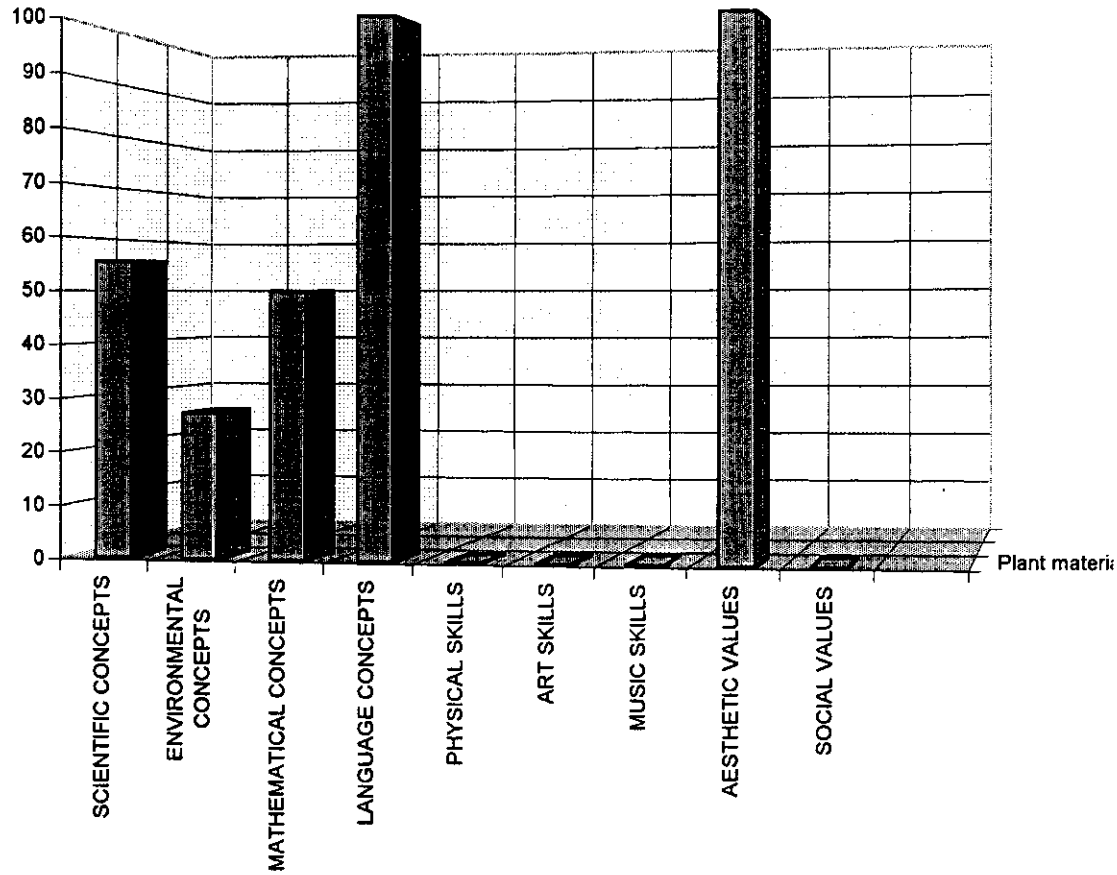
The following plants , *Acer pesudoplatonus leopoldii* , *Prunus serulata* , *Cercis sliquastrum* and *Laburunum anagyroides were* used to control direct solar radiation by shading the sun and by intercepting reflected radiation from surfaces . Part of the sun radiation is absorbed , reflected and transmitted through the leaves .Deciduous trees in full leaf are the best solar radiation control devices when the sun's rays are most oppressive in temperate climate . When the leaves have been shed , the rays of the sun and its resultant heat are usually pleasing in winter . Also the plants in the design provided insulation for the surface of the garden not, only from the intense heat of solar radiation , but also from abrupt temperature changes .Deciduous trees are good temperature control devices , in that they cool in summer and yet allow winter sun to pass through . In this connection , trees play a promising role in controlling the micro climate . Because plants block and filter solar radiation , inhibit windflow , transpire water into the atmosphere and reduce the evaporation from the soil , a micro climate of controlled humidity and temperature exists under trees . The relatively high humidity and low evaporation rate acts to stabilize temperature , keeping it lower than the surrounding air during the day and preventing it from dropping greatly at night .

The plant materials acted to fulfill the education aspects by 31. 3 % , Fig (38) . Texture , development , color smell and sound as scientific concepts were fulfilled in rate 55.6 % .through plants materials .

The texture of each plant can be expressed in a number of ways . Texture varies also with the distance of the viewer from the plant and related , usually by contrast to adjacent texture . The plants with large leaves express a coarse texture during summer , but in contrast with other plants during winter its branches patterns are fine in texture . In our design ,the large leaves of *Magnolia soulangeana* expressed a coarse texture and the branching pattern was also coarse in winter . Evergreens as *Thuja orientalis* , and *Acer palmatum atropurpurum* . offer the advantage of consistent fine texture . Both of coarse and fine texture provide a year around consistency in our

DESIGN ASPECTS
Plant materials

Figure 38 : The relation between the education aspects and the plant materials



design .The fine texture was expressed by lawns was considerd in our design .

As for the development concept , plants indicate the cycle of winter , spring summer and autumn . Also like man and animals , go through a cycle of growth , death and decay . While shadows of plants create patterns of beauty on paving and the surface of the garden , and these change by the hours as the earth rotates .

The plant materials achieved the environmental concepts by 27.3 % , through teaching children the concept of plants and food with vegetables and fruits in the Vegetables garden . Also , through teaching them water concept by the vegetables and fruit plants . The plant materials devoid of all poisonous and harmful plants for children security , Table (7) .

The plant materials fulfilled the aesthetic values by 100 % . Plants are used esthetically depending on their collectively or indivedually beauty . Bird may be attracted to plants because of their berries , nuts , fruits or for their potential shelter . Children attract to plants because colors , odor , shade , beauty , texture or their food .

The flowers and leaves of plants create pleasant scents . The blossoms of *Magnolia soulangeana* , *Osmantus aquifolium* and leaves of *Lavandula anagustifolia* are examples , which exude pleasant scent in the garden .

As for sound concept , leaves moving on the trees by wind create pleasing sounds . Plants attract birds which create sounds . The wind moving through plants create stimulating sounds to the hearer .

The seven areas through the design achieved the educational aspects that children should learn in the garden , Fig. (39) . The Sea garden fulfilled the greatest educational aspects (concepts , skills and values) with 41.7 % .The Nature garden and Vegetables garden were similar in achieving the educational aspects with 29.2 % for each .The Open play area , The butterfly garden , suspension bridge , the Rainbow garden and Alphabet / Music board followed by 20.8 % , 18.8 % , 12.5 % , 10.4 % , and 10.4 % respectively . The least achievement in the educational aspects was for the Paved area which scored only 4.2 % .

Table 7 : Some poisonous plants must be avoided in children gardens *

Plant	Poisonous part	Symptoms
1 - *Alianthus altissima*	Flowers - leaves	Dizziness - Nausea
2 - *Aralia spinosa*	Bark	Nausea - Colic - Vomiting
3 - *Anemon sp.*	Flowers - Bulbs	Diarrhoea - Vomiting - Death
4 - *Asparagus officinalis*	Young stem	Dermatitis in skin
6 - *Catalba speciosa*	Flowers	Dermatitis in skin
7 - *Datura stamonium*	Flowers - Leaves	Dizziness - Unconsciousness
8 - *Delphinium sp.*	Leaves - Seed	Decreased pleasure - irregular heart action
9 - *Deolnix rigia*	Fruits	Dermatitis - Colic - Nausea
0 - *Dieffenbachia sp.*	Leaves - Flowers	Respiratory paralysis - Death
1 - *Euphorbia sp.*	Milky juice	Dermatitis eyes and skin
2 - *Ginko biloba*	Fruits	Dermatitis in skin
3 - *Lagonaria sp.*	Fruits	Dermatitis in skin
4 - *Lonicera sp* .	Leaves - Flowers	Death - Irregular heart action
5 - *Lantana camara*	Flowers - Fruits	Irregular heart action - Death
6 - *Ligustrum sp.*	Leaves	Vomiting - Dizziness
7 - *Lobelia inflata*	Flowers - Leaves	Dermatitis in skin
8 - *Nerium oleander*	Leaves - Flowers	Dermatitis in eyes - Irregular heart action Death
9 - *Narcissius sp*	Flowers - Bulbs	Vomiting - Diarrhoea - Death
0 - *Polygonium sp*	Leaves	Dermatitis in skin
1 - Primula sp.	Leaves - Flowers	Dizziness - Respiratory paralysis
2- Rhododendron sp.	Leaves - Flowers	Vomiting - Dizziness
3- Robinia pseudocacia	Leaves	Dermatitis in skin

* Poisonous plants , Muenscher , 1951 .

DESIGN ASPECTS	EDUCATION ASPECTS
I - Sea garden	41.7
II - Open play area	20.8
III - Paved area	4.2
IV - Vegetables & fruit garden	29.2
V - Nature garden	29.2
VI - Rainbow garden	10.4
VII - Butterfly garden	18.8
VIII - Suspension bridge	12.5
IX - Play huts	10.4
X- Alphabet / Music beam	10.4

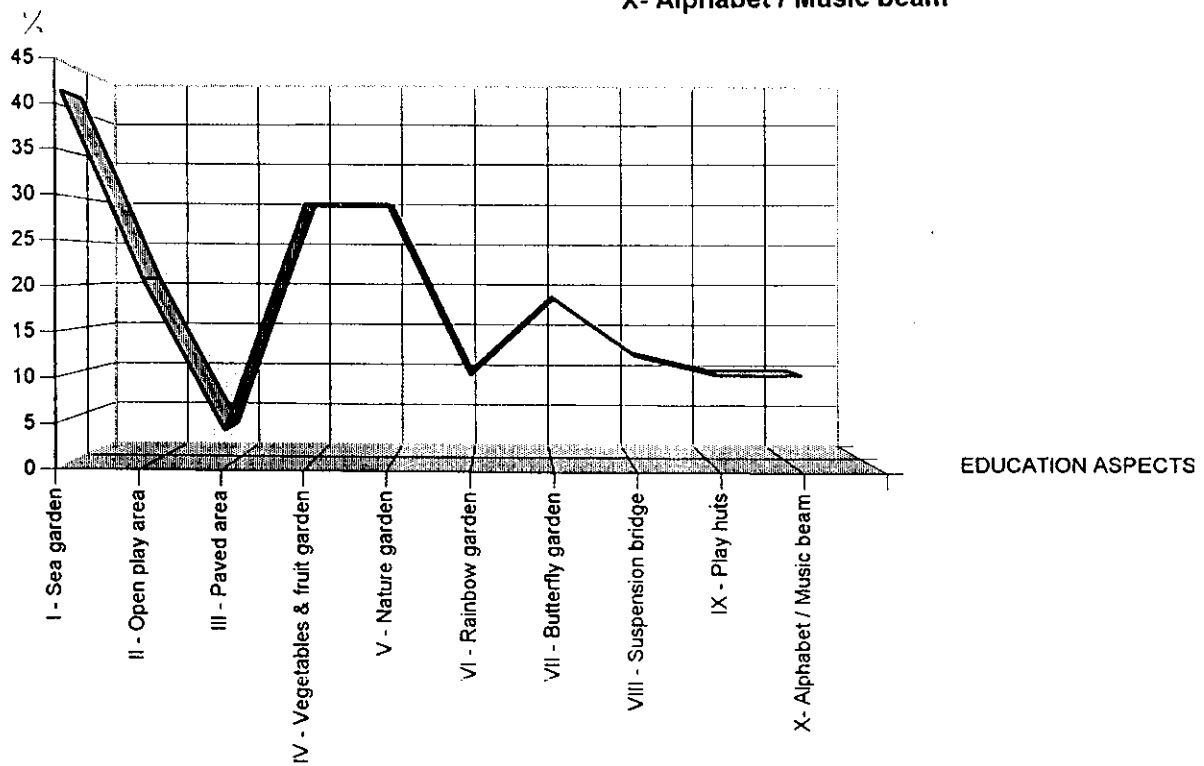


Figure 39 : The relation between design aspects and the areas .

Paths in the design : -

As for the materials used in paths , the use of elastic tiles and gravel materials for paths acted as protective surfaces , to absorb the shocks for falling children Fig. (3) . Wherever , there is a danger of children falling off the landing surface should cushion that fall . The danger is increased when children are in motion . most accidents are the result of falls . Therefore , it is unwise to specify or indeed accept , rigid , unyielding paving materials , such as concrete or tarmac for paths . Sand , gravel , rubber mating and wood chips are a protective surface for using as paths , (U. S .CPSC ,1978) . Paths in the design fulfilled the needs of the teachers , for a safety paths , which served before . Through the curved paths in the design children drive vehicles and learn traffic roles .

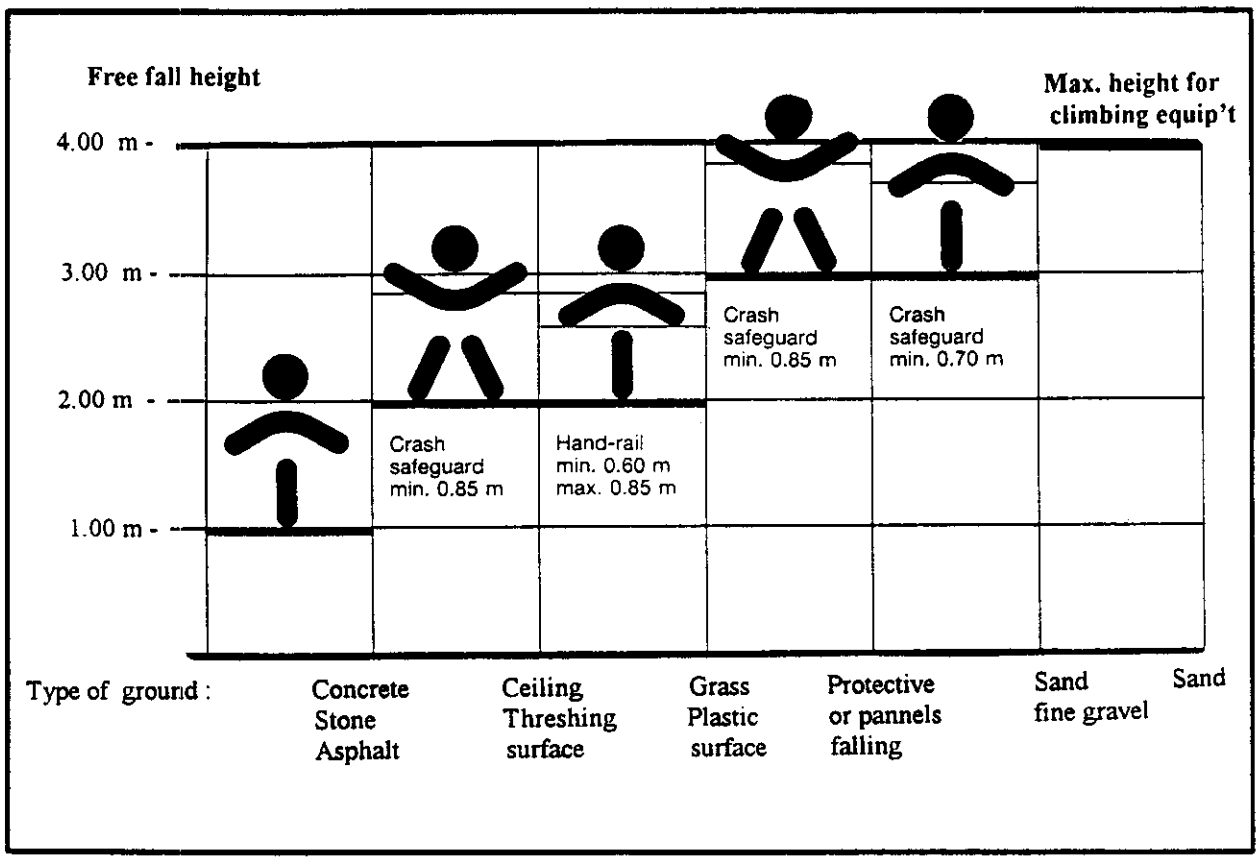
The Sea garden area :-

Sand was used to cover this area and under the play equipment with a layer of 30 cm . depth , resulted in a natural and protective surface for absorbing shocks due to children falls . Sand is considered as one of the best natural materials to absorb the shock . (DIN ,7926) . This layer of sand can absorb the shocks for children falls in maximally for four meters height , (Fig 40) .

Playing with sand is one of the most popular and most valuable occupation from the educational point of view . Sand serves especially to develop the imaginative and creative powers of the child . Sand therefore is the most important element for any children garden or playground .

Safety zones for each play equipment in the Sea garden resulting was considered to raise the safety factor with play equipment . In addition all the play equipment used for children in the Sea garden were subjected to quality and strength tests to insure that structure and material of play equipment meet the safety standards . The safety factor is one of the most important factors that should be design of play equipment . The second important factor is the site of

ure 40 **Types of ground in relation to the free fall height ***



*** DIN 7926 part 1**

play equipment . The play equipment must meet the standards by the specialized scientific institutes like , DIN (Deutsches Institut fur normung) , BS (British Standard Institute) , US - CPSC (US - Consumer Product Safety Commission) , C EN (European Committee for standardization)...et .

The position of the play equipment in one place area " Sea garden " resulted in abundance of different activities at a single site which gave the children the chance to perform more than one activity included in one area . There are different ways to arrange the play equipment on the playground , (axes , routing , series and groups) . The effect of play equipment arrangement in circle field is dynamic with elements , (Meindertsma , 1987) .

The area as (200 sq. m.) , used for the " Sea garden " area was enough for the various play equipment which were chosen . The area was devoted to the play equipment itself, the safety zone for each play equipment, and children requirements for play with sand , (13 sq. m), Table (8)

Table : The area of play equipment and safety zone

Play equipment	Play equipment area and safety zone
1 - Zoo , spiral play equipment	32 Sq m .
2 - Seesaw swings	22 Sq m .
3 - Slide play equipment	30 Sq m .
4 - Fishing boat play struc.	48 Sq m .
5 - Water playtables	27 Sq m .

The use of sand in the Sea garden resulted in a reasonable area for children to play with the sand which is usually placed on the dug area or a sand box and too small for children play , (Palmes , 1959) .

All play equipment were chosen in the design made from wood . The response of children for wood materials is positive than other materials like plastics . Wood is a natural ethnic material ideally suited for children makes sense only .

The Sea garden achieved the concepts that children can learn in the garden to fulfilled 11.1 % of the scientific concepts Fig .(41) . This was shown by the Water playtables that educated the children float concept , one of the various concepts . The Sea garden , also achieved the environmental concepts by 18.2 % , which was demonstrated by the animals concept , through the zoo and water concept , through using the Water playtables . In addition , the Sea garden succeeded in teaching 50 % of the language skills through vocabulary for the animals names of zoo .

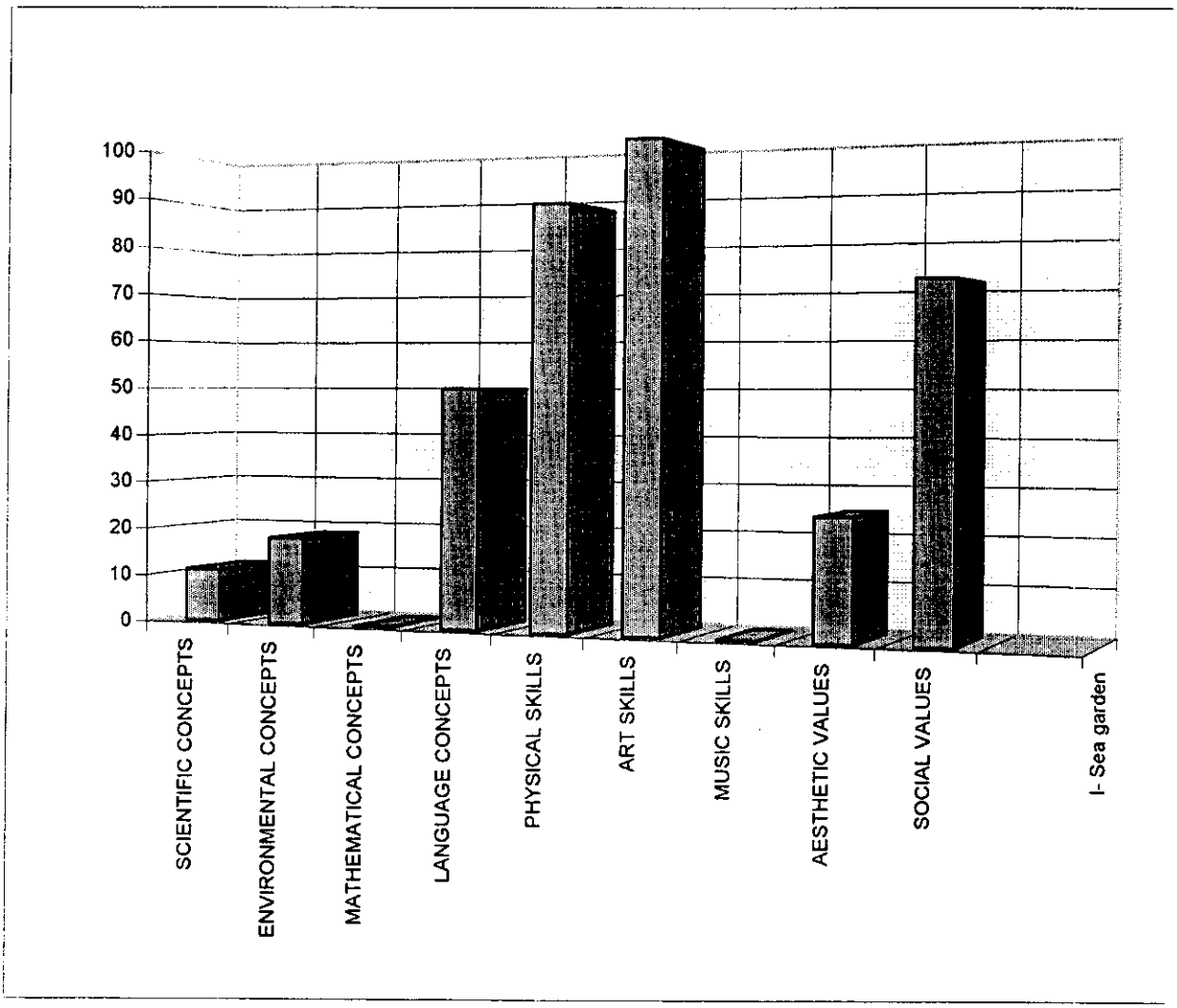
The Sea garden , through the play equipment provided children to learn many skills by 76.9 % . The highest physical skills 87.5 % were achieved in the Sea garden practicing the skills of jump , running , climbing , catching , pushing skating and balance . 100 % of the Art skills were achieved in the Sea garden mainly by allowing children to play with sand .

The Sea garden resulted in teaching the different values to children by 54.4 % . Also social values , cooperation , obedience , systematic , independence and cleanliness were achieved by 71.4 % . Regarding the aesthetic values , 25 % was achieved based on the conformity values indicated by the presence of the units together .

DESIGN ASPECTS

I- Sea garden

Figure 41 : The relation between The education aspects and The Sea garden



The Open play area : -

The open play area was designed from lawn , and in the middle part of the garden and acted as , a basic color for the area . Lawn is considered as the most important element in the garden . Lawn is aesthetic and most attractive front for the garden which help in brining the joy , happiness and mental relief . The lawn points out the other elements and other areas surrounded in the design . Third , the use of lawn for the Open play area prevented rousing of dust due to the play in the area . A dusty playground is harmful to the health of the children using it , but it is also a cause annoyance to . The dusty playground become a muddy in winter rain falls .

Any Kindergarten garden should contain an Open play area for running and free play of children , (Fog , 1989) . The study of children behavior with materials and play equipment indicated that nearly (13 %) of children use this area . So , the Open play area (347 sq. m) used in the design was enough for the free play .

The Open play area fulfilled the Scientific concepts , Fig . (42) by 22.2 % , through learning children Texture of Rolawn maze and sound differentiation with Parabolic dish .

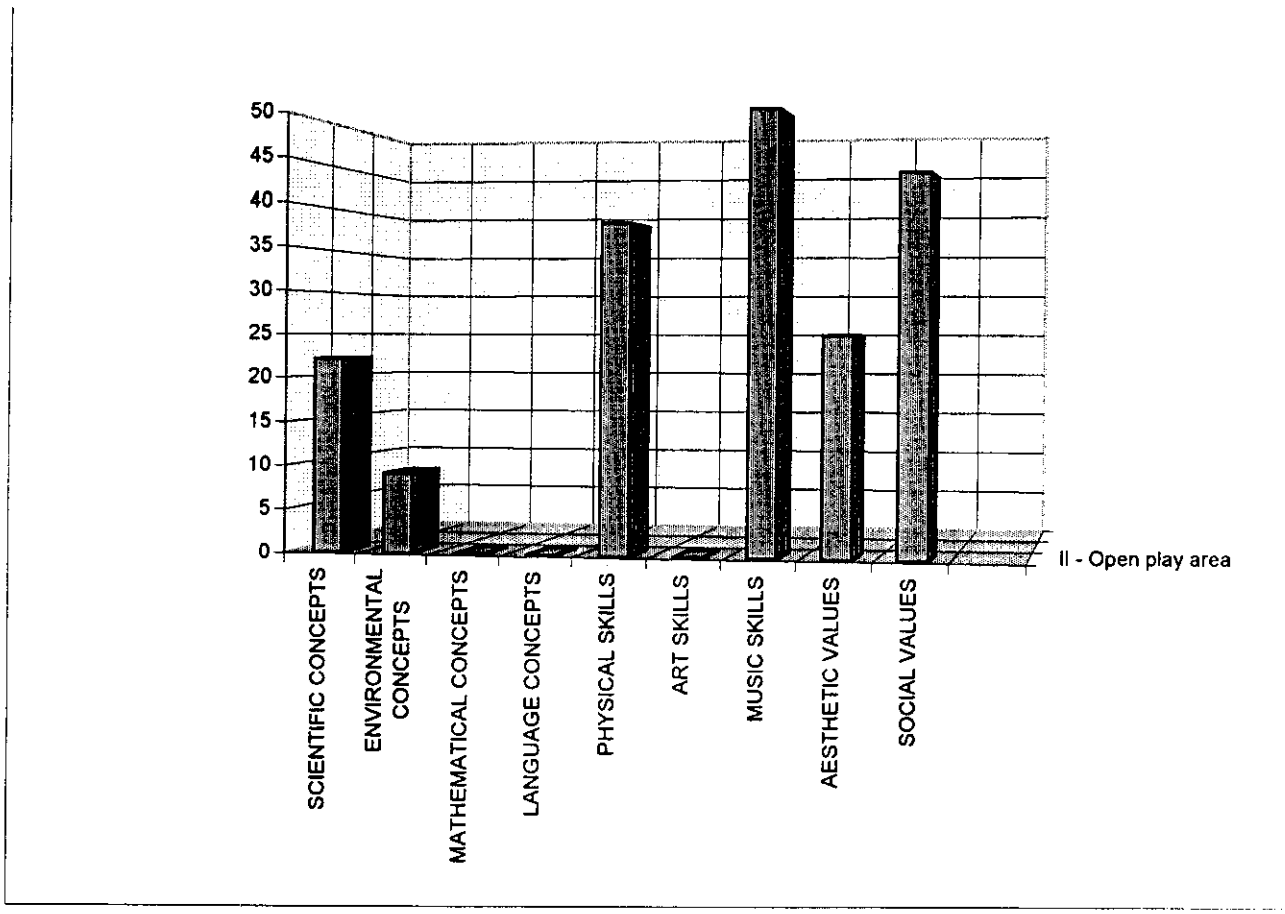
The Rolawn maze acted as stimulate children's imagination through their running in the Open play area . The Rolawn maze offered two kinds of textures through the play , smooth for lawn and rough for sand .

Also , the open play area fulfilled the Environmental concepts , Physical skills , Music skills , Social values , by 9 % , 37 .5 % , 50 % , 42 .9 % , respectively . Children through play on the Open play area can learn run , jump and cache , including cooperation , independence and obedience .

DESIGN ASPECTS

II - Open play area

igure 42 : **The realation between the eduction aspects and the Open play area**



The paved area : -

Planting is the most important means of creating beauty in the play area ,but it is not the only one , concrete and other materials have an inherent quality that contribute to the beauty of an area in the form of well planned structures . The texture quality of paving is highly significant . The texture of paving area roughness of surface compared with the lawn surface in the Open play area showed a beautiful contrast . The concepts of unity can be extended to the formation of design between indoor and outdoor space . The paved area was designed in the middle , and attached with the activity rooms , so it linked activity rooms with the garden . Also , the Paved area was designed as complement area to others areas , so it created the sense of harmony and the sense of unity . The Paved area of approximately (100 sq. m.) in addition the paths which served 25 children , (one class) . The Paved area fulfilled the needs of teachers , and children, for driving bicycles , cars (learning traffic roles) , as well as usage of for drawing on concrete surface , and gave open air theater and outdoor classes .

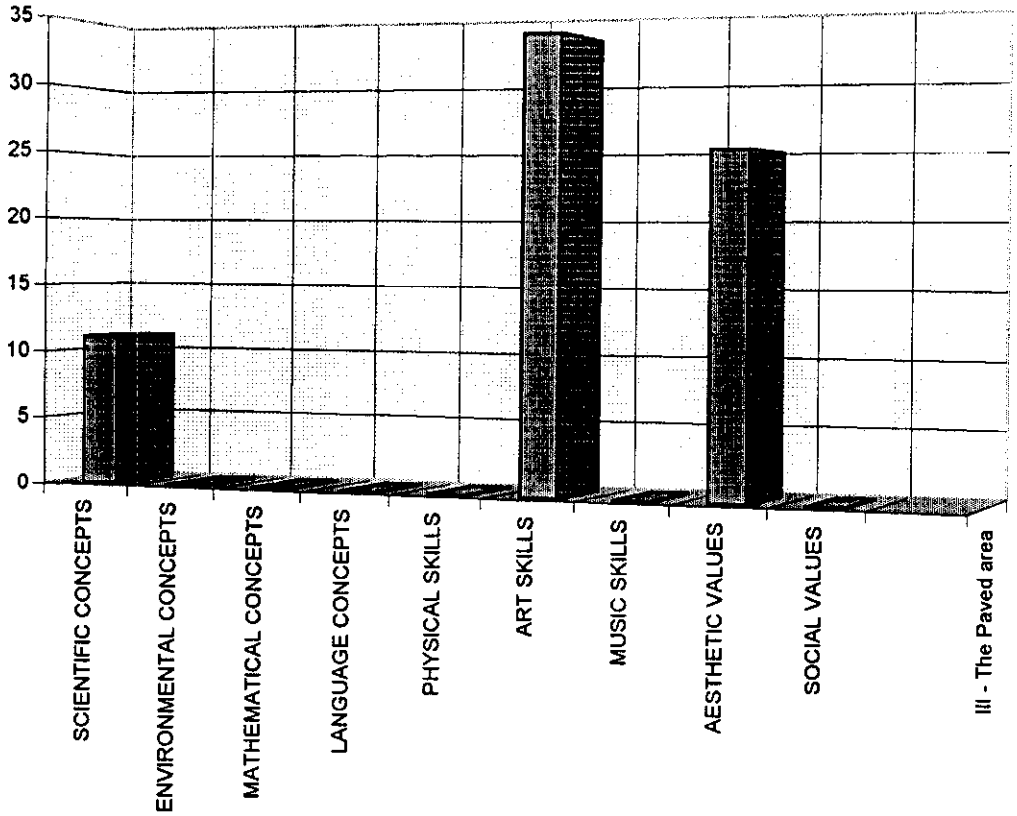
The Paved area achieved the scientific aspects that children can learn in the garden Fig . (43) by 11.1 % . Children through play in Paved area sense the texture of concrete . Also , the Paved area achieved the Art skills and Aesthetic values by 33.3 % , 25 % respectively . Drawing with the color chalk on concrete , is very lovely activity for children . Teachers , also were interested for this activity in all kindergarten .

The data agreed with Lisney and Fieldhouse, 1990 , shadows of plants create patterns of beauty on paving , and paths and these changes by the hour as the earth rotates . Pattern in summer will have sharp contrast with the bright sunlight , but the bar branches of winter will create intricate , more subtle patterns .

DESIGN ASPECTS

III - The Paved area

Figure 43 : The relation between The education aspects and the Paved area



The vegetables and Fruit garden : -

The Vegetables and Fruit garden offer some gardening activities , that children doing themselves . children dig , get seeds , and put seeds in the soil as preparation of Vegetables garden . Children water the seeds , the plants , and get weeds out . Children see the plants growing , pull out the vegetables and fruits and eat it . The Vegetables and Fruit garden provide effective contrast in form and contrasting color of the Vegetables .

The Vegetables and Fruit garden in the design achieved the scientific concepts , Fig . (44) by 44.4 % . Children learn development concept , for seeing Vegetables grow . Children learn the colors concept of vegetables and fruits . Children sense and enjoy shade under The sunburst pergola .

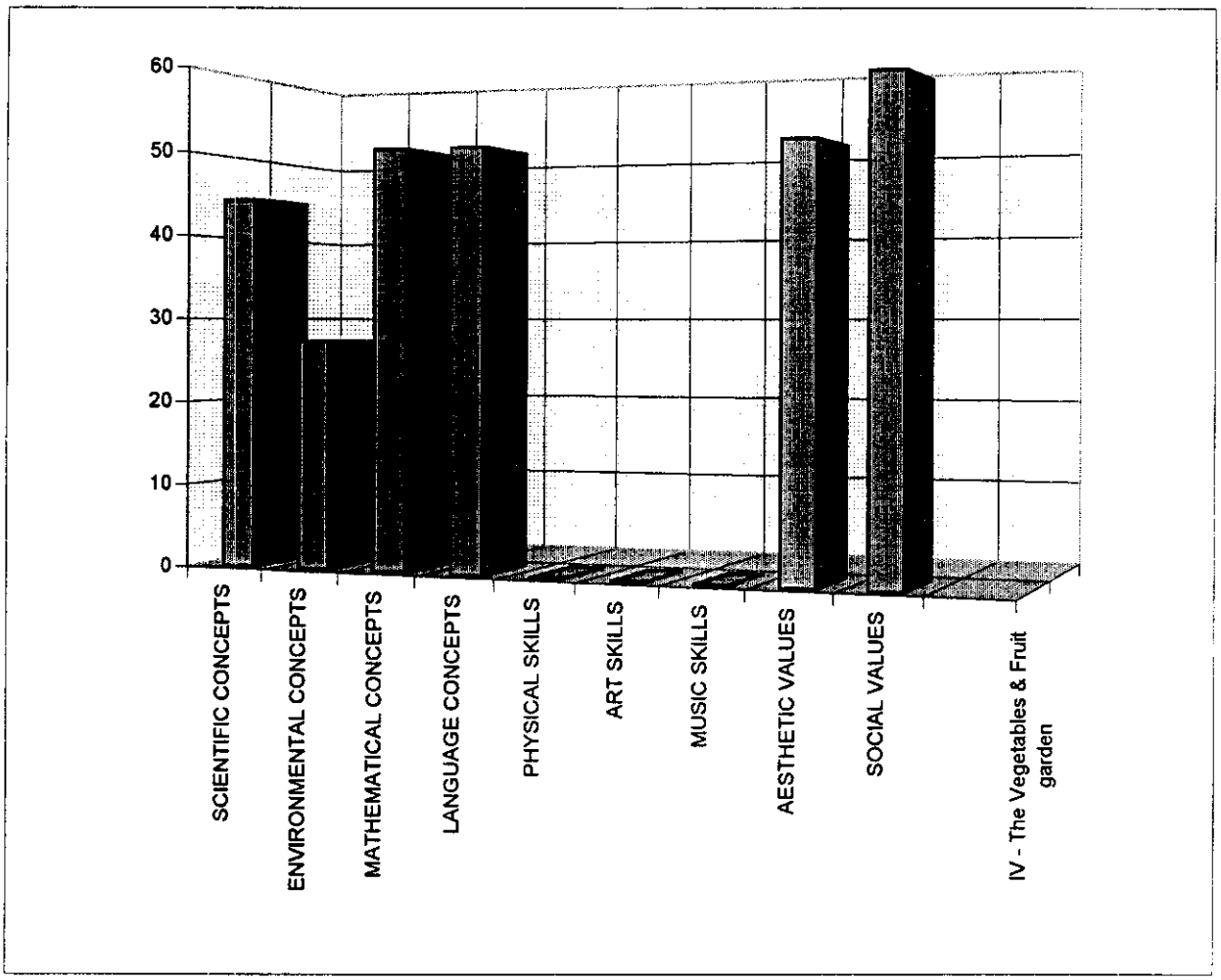
Also , the Vegetables and fruit garden fulfilled the Environmental concepts by 27.3% . As Environmental concepts , children learn plants concept , water concept , food concept , earth concept , and life concept .

Children learn the names of vegetables and fruits , as Language concepts through their activities in this area and learn cooperation , obedience and care values also . As Aesthetic values , Children see the harmony between fruits and leaves of fruit plants in containers , such as *Citrus limone toscano and Citrus merenii* . All above concepts were considered in the garden , and there creative lines help the children to act and fulfill their needs

DESIGN ASPECTS

IV - The Vegetables & Fruit garden

Figure 44 The relation between The education aspects and the Vegetables & Fruit garden



The nature garden : -

Children naturally love beauty and are attracted to the nature . Play has a much greater influence and appeal on the childhood if it is carried on a mid attractive surroundings , plants and equipment . . Children love to play in a more pleasant environment than in a closed area .

Children's attraction to refuge in the environment . The need to " see without being seen " was essential during early stages of human evolutionary history . Refuge provided the opportunity to hide or find a shelter while still monitoring the surrounding environment .

Juniperus pfizeriana L., was used as nature refuge which offers a high degree of plasticity and manipulability . The refuge which has a degree of plasticity and manipulability parts is better suited to meet individual needs and play objectives . Kindergarten engaging in symbolic games (dramatic play) may pretend that a hedge is a house or get under table and to imagine a castle , or to craw under a juniper shrub into their spaceship . School children playing hide -and - seek or capture the flag are engaging in games with roles , (Kirkby, 1989) .

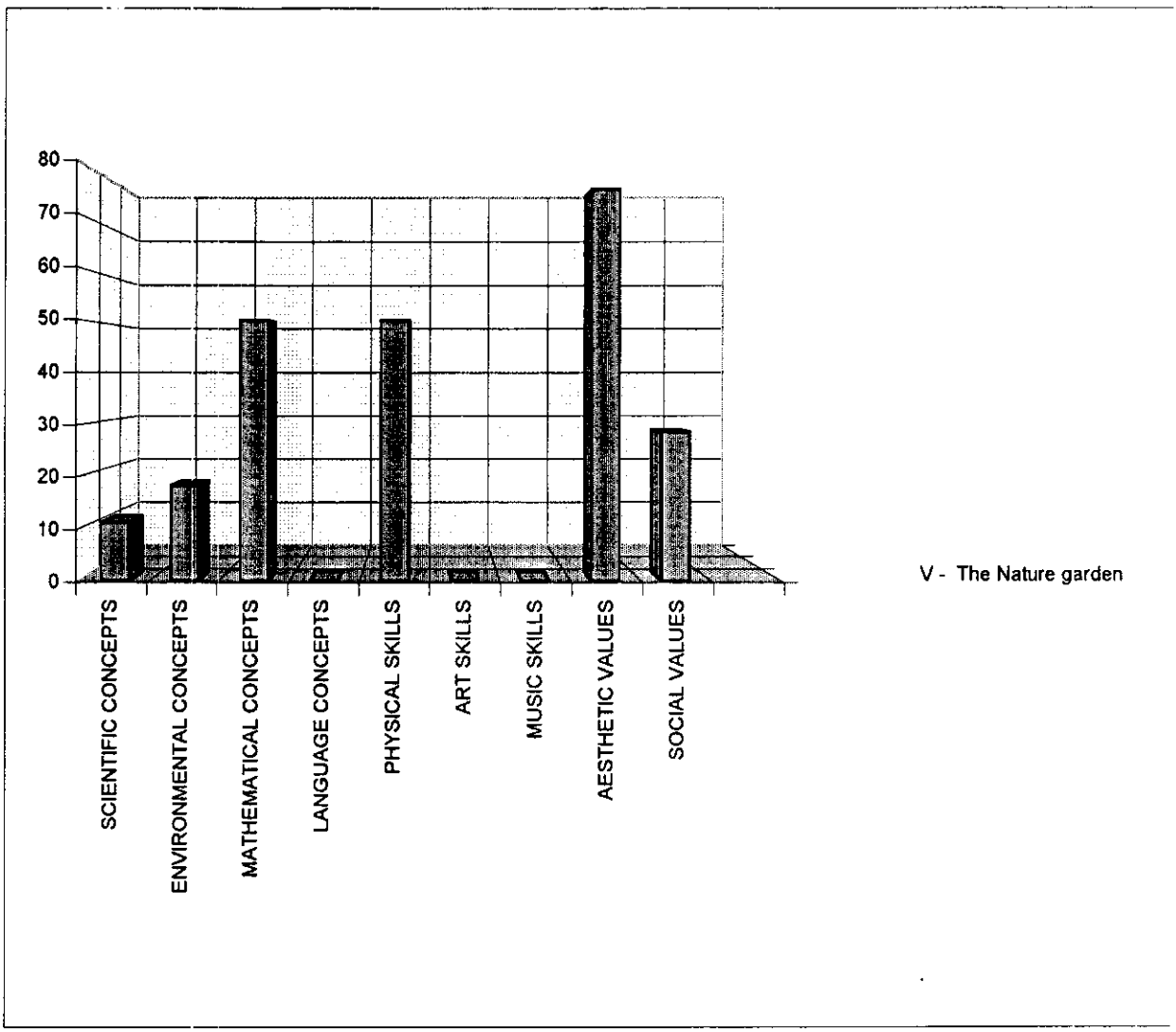
Water features are among the most striking garden elements . The sound of water , the stillness of a quite reflecting pool capture viewer's attention and draws them to these delightful places in the garden . The sight and sound of tumbling splashing water is always attractive . The sloping site was in harmony to the effectiveness of the cascade . This was also considered in our design of the kindergarten garden .

The Nature garden achieved the Scientific concepts , Environmental concepts , Mathematical concepts , Physical skills , Aesthetic values and Social values by 11.1 % ,18.2 % , 50 % ,50 %, 75 % ,28.6 % , respectively , Fig . (45) . Children learn formal shapes through the forms of *Buxus sempervirens* , (spiral , ball and cubic) . Children by feeding birds in birdfeeder learn the care and kindness .

DESIGN ASPECTS

V - The Nature garden

Figure 45 : The relation between the education aspects and the the Nature garden



The Rainbow garden : -

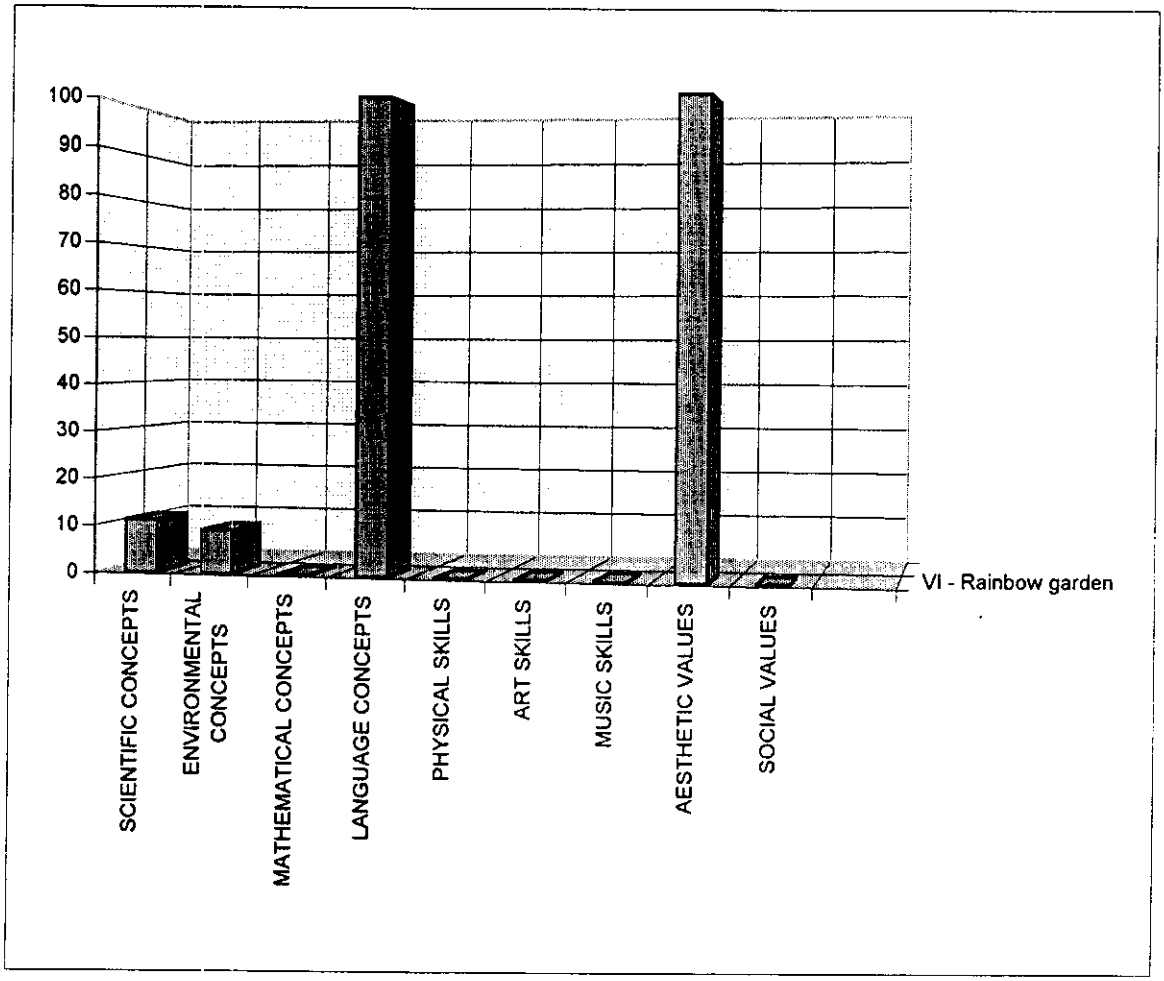
Children have a natural love for color and respond spontaneously to it . Color concept , itself , is one of the most important concepts , it has major more interest for the educational professors and teachers . The arrangement of plants in a similar way the Rainbow color , afford children to learn the basic colors , (red , orange , yellow , green ,blue green , blue , and violet) . Brightly painted letters of the Alphabet are placed behind the plants . Showing the letters of the Alphabet next to the plants encourage careful observation of the plants , for example , the letter " R " stands behind the color red , will learn the child the name of such color .

The Rainbow garden fulfilled the scientific concepts by 11.1 % , Fig. (46) . Children learn color concept through their play in the Rainbow garden . Also, children learn plants concept through the Rainbow garden , as the Environmental concept with (9 %) .

The Rainbow garden achieved 100 % for the Language concepts, and The Aesthetic values . Children see the harmony of color and contrast for the Rainbow garden .

DESIGN ASPECTS
VI - Rainbow garden

Figure 46 : The relation between the education aspects and the Rainbow garden



VII - The Butterfly garden : -

The Butterfly garden attract hundreds of butterflies , so much so that some children ask the teacher if they can touch the flowers with wings . Butterflies are often considered to be one of the most sensitive barometers of the entire environment . Children have been absolutely thrilled by seeing so many dozen s of butterflies around the border of brightly colors of flowers.

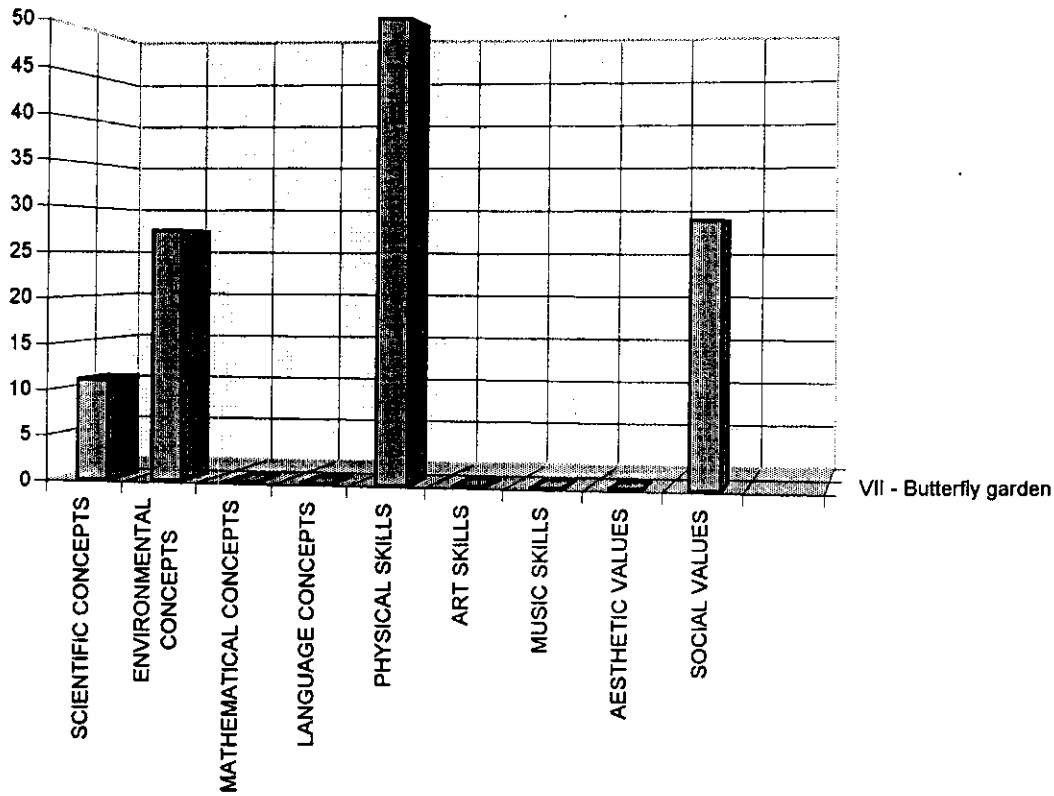
The butterfly garden fulfilled the Scientific concepts by 11.1 % , Fig . (47) . Children learn development and color concepts , as scientific concepts through this garden . Also , it achieved the Environmental concepts by 27.3 % . Children learn animals , life and death concepts through the Butterfly garden . Children run , jump , cache and throw skills , as Physical skills with butterflies . Also , children learn care and independence values in play with butterflies .

Generally the design fulfilled four categories of play equipment physical , social , creative and quite play through the areas and play equipment . Also through the activities in the garden , children come to grasp two vital concepts about nature . One is that trees , flowers , leaves , vegetables , fruits , sand , rocks , water , soil, butterflies and birds are very different from things that are manufactured . The pleasure children find in watching the beauty and variety of growing plants . The second is that nature is atonality a cycle of changes into we are born , with natural laws, that if interrupted or abandoned , will lead to destructive consequences .Gardening leads children to intelligent contemplation of nature as well as an awareness of appreciation for their environment . Children are able to identify many of the events , properties , and characteristics of the experiences of making and enjoying the garden . In addition to specifying particular plants , young children were also able to describe characteristics of color , scent , size , texture , and function of the plants . They were also concerned with other characteristics of the layout , such as varied surfaces and artifacts in the garden (Whiren , 1995) .

DESIGN ASPECTS

VII - Butterfly garden

Figure 47 The relation between the education aspects and the Butterfly garden



The design provided unique separate places . Qualitatively different areas for active versus passive , noisy versus quite , and mess versus clean activities which gave the garden more interesting and interpretable for children . The design provided both open and closed areas and thus accommodated a variety of play activities . The design also provided a variety of color through the landscape and play equipment . The design added a variety of texture by using the surfaces materials (lawn , sand , concrete , and gravel) to accommodate different activities . The garden design and equipment gave their function for play formats in mind . This postulate appears to be self -evident , and how many garden there (one feels tempted to say most of them) where the feeling are unsuitable , and the design merely planned around the trees and shrubs which had been placed by a designer who consisted his task purely from the gardener's aesthetic point of view . Architects , landscape designers and educationists have to work together in order to produce good solutions to kindergarten gardens . According to Palmes , 1959,the garden is not meant to be passive entertainment but it must encourage the active , spontaneous and creative play .

Kindergarten in Egypt : -

The amount of outdoor space required for a kindergarten varies from country to country . In Denmark 35 sq. .m . , 27 sq. m . in Sweden , 20 sq. m. in Norway , 18 sq. . m. in Spain , 10 sq. . m . in England , and 6 sq. .m .in Italy are needed for a child . Many countries do not have any minimum requirements for the outdoor space for the child . Ideally there should be at least 9 sq. . m . per child . The minimum space required to provide a whole variety of play opportunities is 6oo sq. . meter , (Esbensen., 1987) .

Kindergarten in Egypt do not submit school building law . However , they are usually attached to primary schools and consequently have no specific area or characteristic specification for classes . In addition areas devoted for playground or gardens have no specification , and the areas devoted for playgrounds and gardens are not linked to activity rooms . Rather , these areas are far away from activity rooms and usually small in size .Those areas usually are dusty or poorly paved . There are some kindergarten playgrounds where carpet is used , Fig. (48) . Rarely kindergarten playground under Egyptian condition are covered with grass .

The play equipment available in the Egyptian kindergarten are in different types and lack the safety factors , that are set mainly for children protection . They lack safety regarding their design and their standard characteristics . The play equipment are made of plastics , metals and other materials which were not tested before (in one of the specialized standardization centers) .

Also , the arrangement of the different play equipment in the Egyptian kindergartens have not the safety zones , that should be devoted for each play equipment . The selection of suitable play equipment itself , is not made on specific basis or educational program that aim at promoting physical skills , values or any other concepts .

Our survey showed that when plants are grown in some kindergarten gardens a lot of poisonous plants are grown in Egyptian kindergarten , such as *Lantana camara* , *Euphorbia sp.* , *Nerium oleander, Asparagus officinalis* , *and Ligustrum sp* , etc. .. sch statments created many problem for the hygiene .

The appropriate design for a kindergarten garden under the Egyptian conditions : -

To design an appropriate garden for kindergarten under the Egyptian conditions some rules must be considerd for such garden as following . The area employed should be enough to fulfill the needs of 20 to 25 children (one class) at least . Accordingly it should never less than 400 to 600 sq. m . and must be linked to the activity rooms to provide the free flow in the garden . The garden must comprise at least five areas (Fig . 49 to 58) :-

1 - An area about 160 sq. m .devoted for sand and play equipment to develop the educational aspects , (concepts , skills and values) . The area should comprise, one play structure , one kind of swing , two spring play equipment , one slide play equipment and water play equipment . All play equipment must be sited on sand with 30 cm depth to absorb the shocks of children falls . These play equipment should meet the safety standards , which are based on the judgment of specialized centers . The play equipment must be arranged and spaced as the known of safety standards .

2 - An open play area from lawn , not less than 180 sq. m. .these area comprises play hut and balance beam .These areas serve for free play , (run , jump, cache) . Such lawn will prevent rousing of dust due to play and for safety of children by absorbing the shocks from falling . Also for the aesthetic and attractive values of the lawn in the front garden .

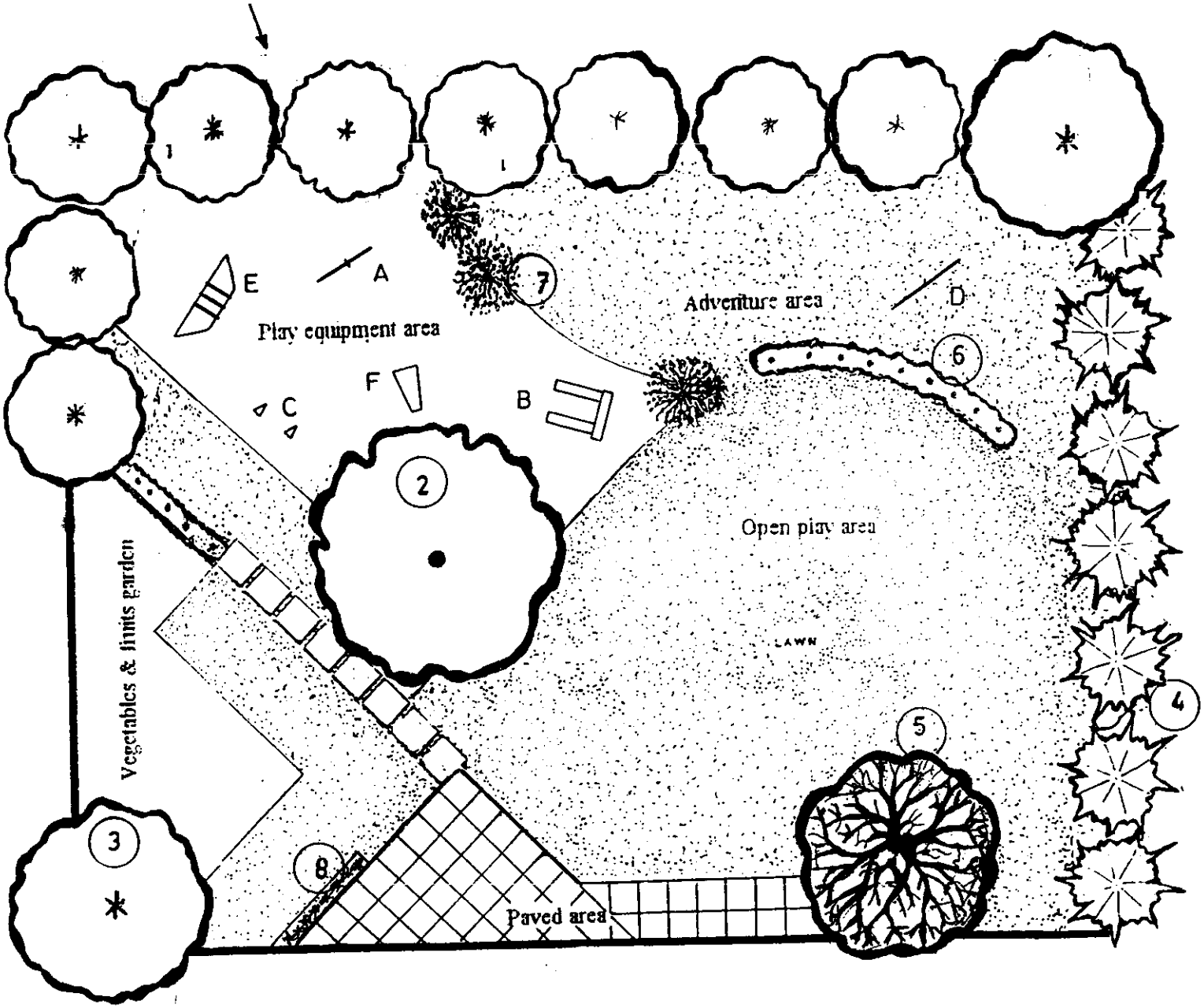
3 - The design proposed a paved area at least 100 sq. m. to be utilized for outdoor classes and vehicles driving . Also by its usage to control the children play in the garden by teachers .

4 - A group of beds grown with vegetables will promote the educational aspects for children . In addition some fruit trees might be included either at the boundaries of the garden or to be grown in containers and a small area as a nursery with several pots for children .

5 - An area as adventure places will fulfill the educational aspects (concepts , skills and values) and for learning environment concepts and for discovery , through the landscape such as a hut from plant materials , which should be density in this area , and tunnel play equipment as refuge place , and place for animals (birds , small pool with color fish) .The area should contain a kind of music play equipment .

Beyond these five areas , there are basic considerations , the areas must be partitioned to prevent any interference between the different activities , the site must be protected from prevailing winds , by using plant materials such as *Cupressus sempervines* . Also the site should provide sun and shade by using deciduous trees , such as *Jacaranda sp.* .

A good design will depend on the proper selection of harmless plants which provide different colors through their growth period . The plant materials must be devoid of poisonous plants . Shaping some plants will add more or less a displaying .



1 - *Tecoma stans*
2 - *Cassia nodosa*
3 - *Salix babylonica*
4 - *Thuja orientalis*
5 - *Callistemon viminalis*
6 - *Myporum pictum*
7 - *Codieum variegatum*
8 - *Pelargonium zonal*
9 - *Hibiscus rosa sinensis*

A - Seesaw swing
B - Waterplay tables
C - Spring play equipment
D - Balance beam
E - Play structures
F - Slide play equipment

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Figure 49 : A proposed design for kindergarten garden in an area 600 m .

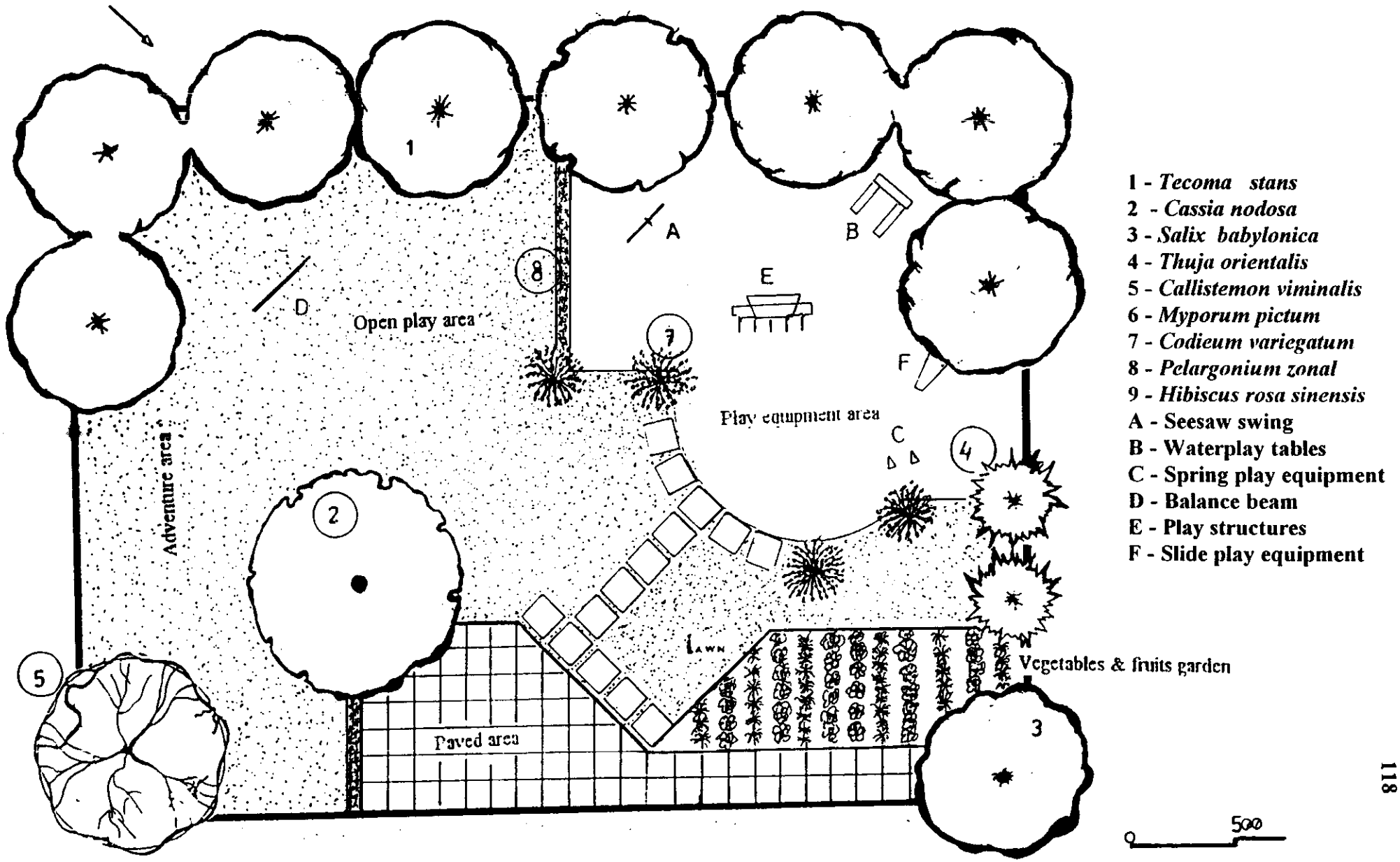


Figure 50 : A proposed design for kindergarten garden in an area 600 m.

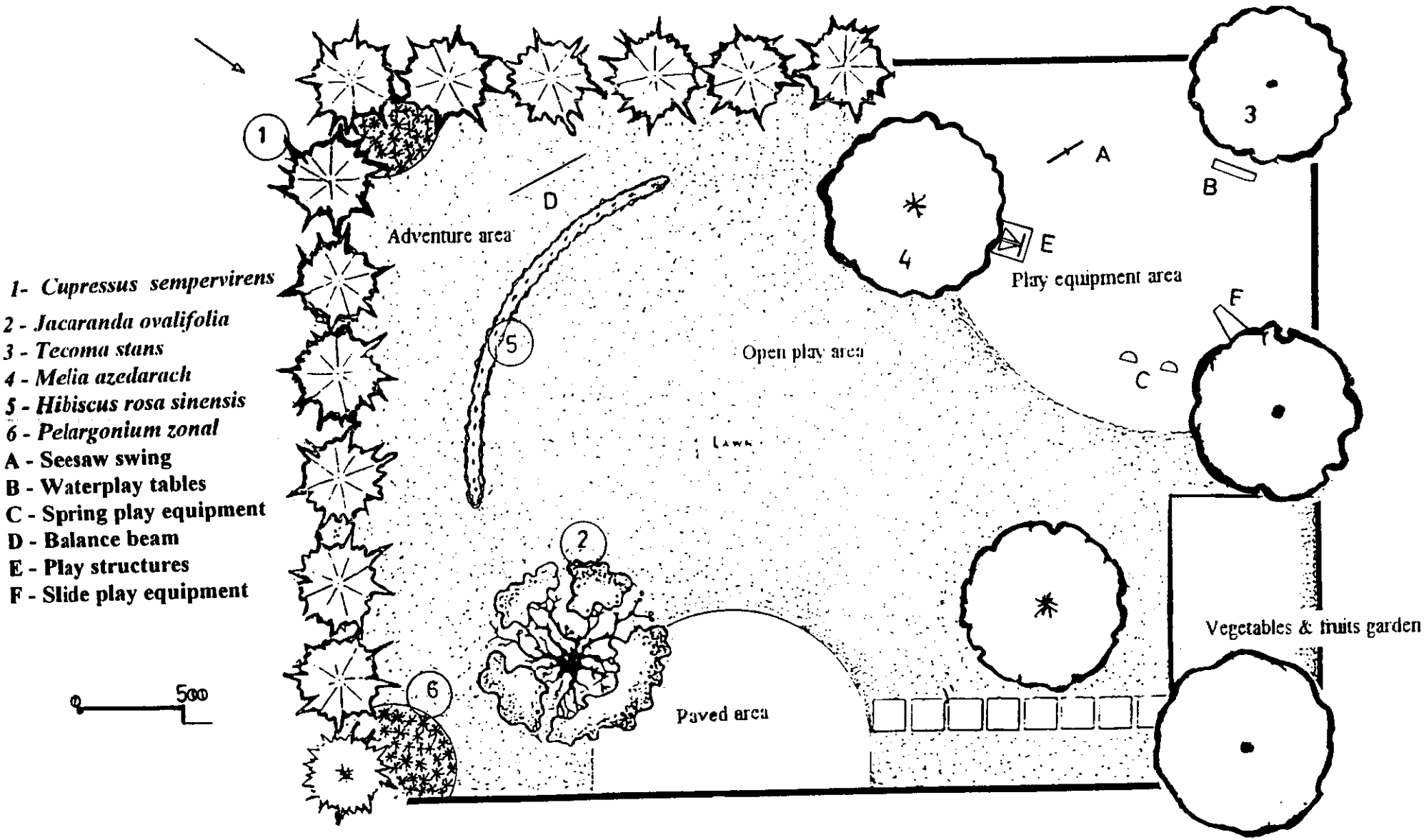


Figure 51 : A proposed design for kindergarten garden in area 600 m .

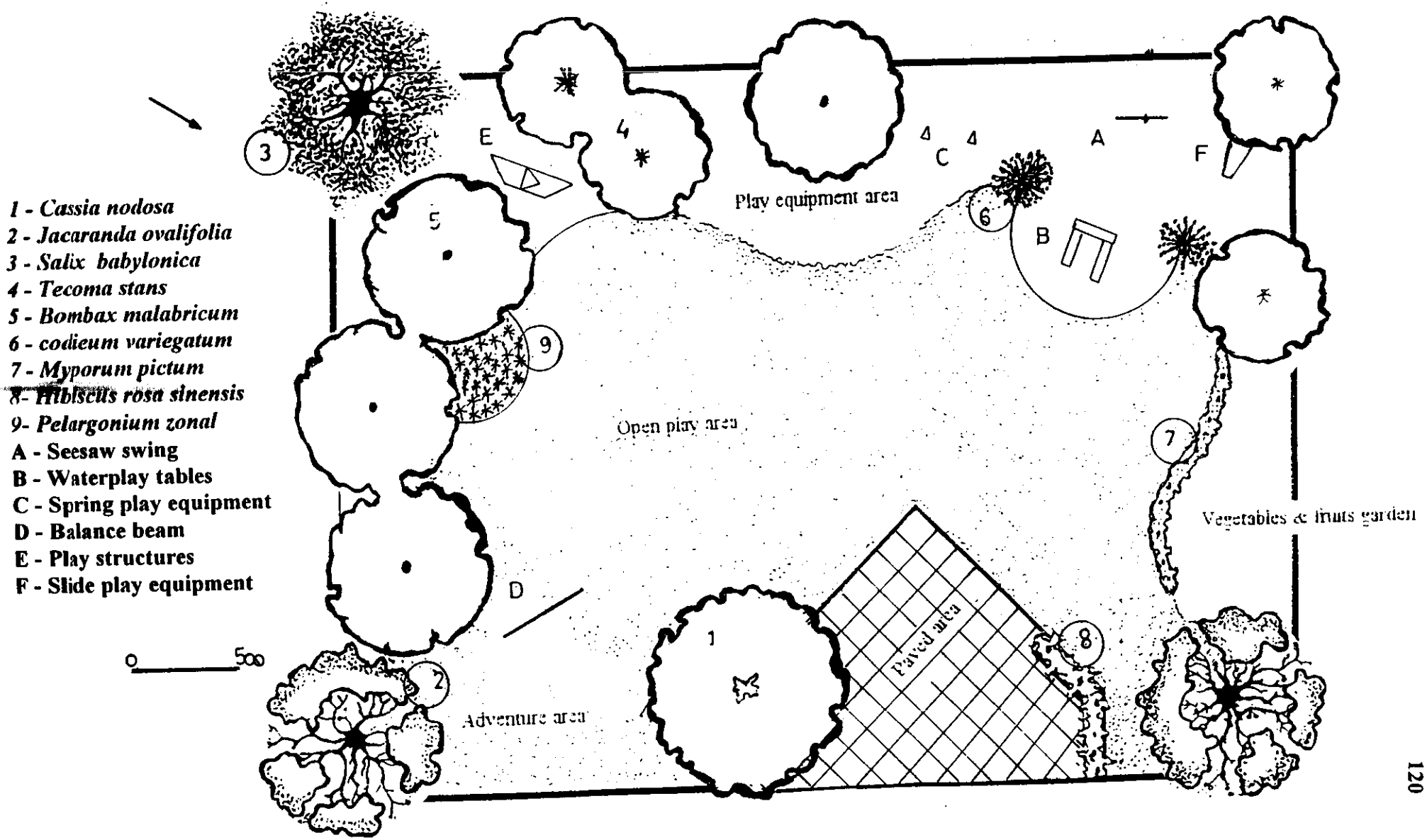


Figure 52 : A proposed design for kindergarten garden in an area 600 m .

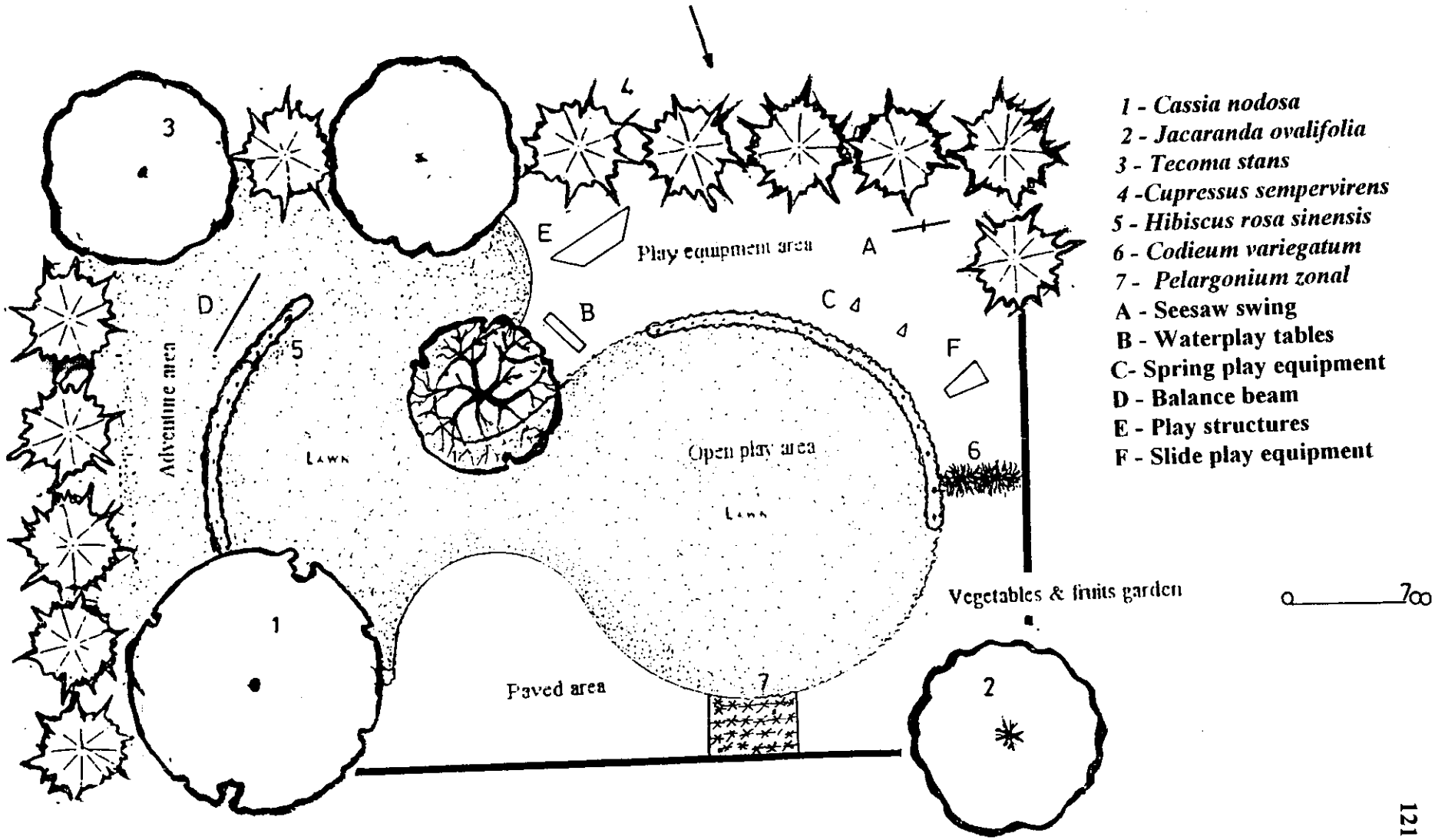


Figure 53 : A proposed design for kindergarten garden in an area 600 m .

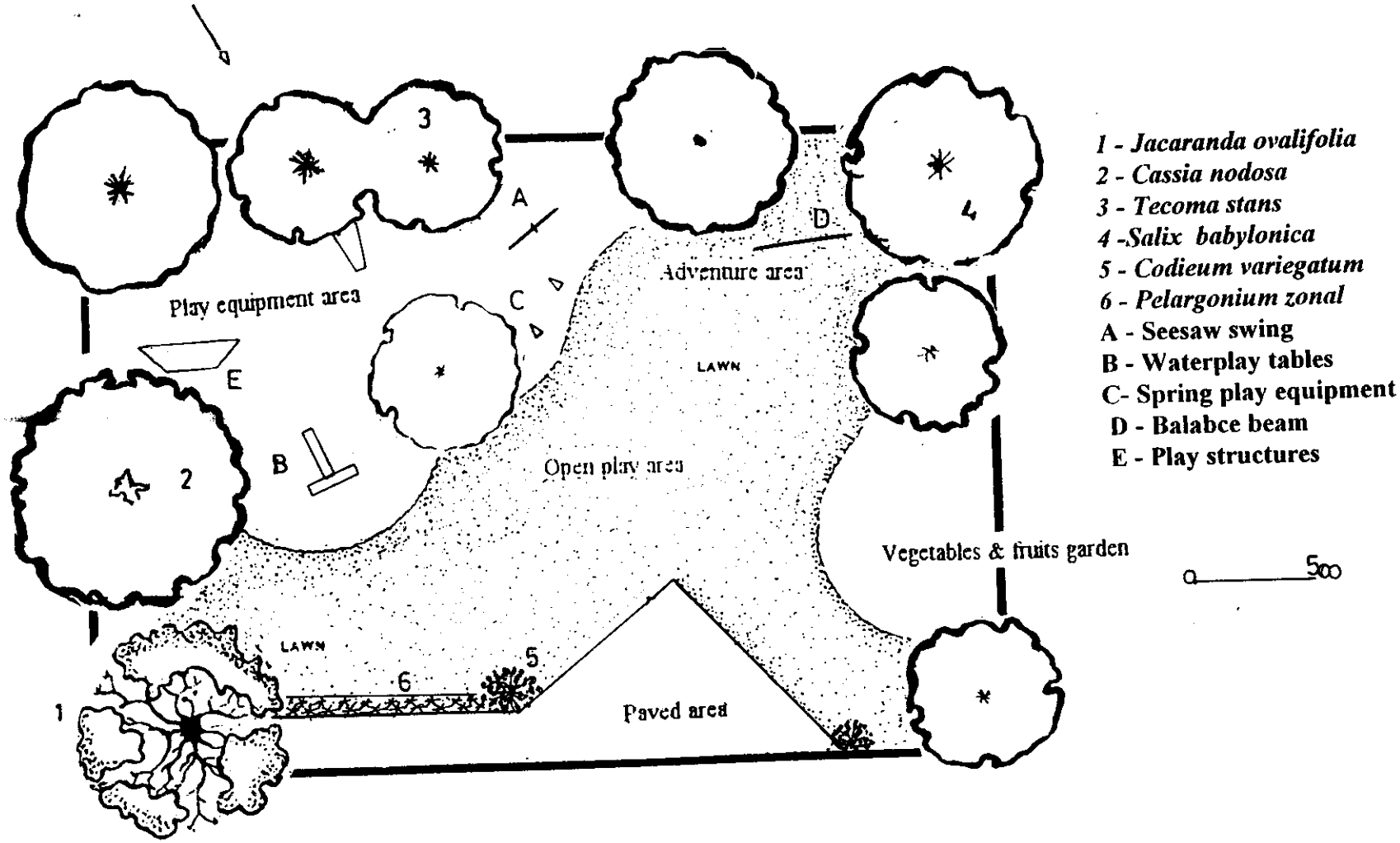


Figure 54 : A proposed design for kindergarten garden in an area 400 m .

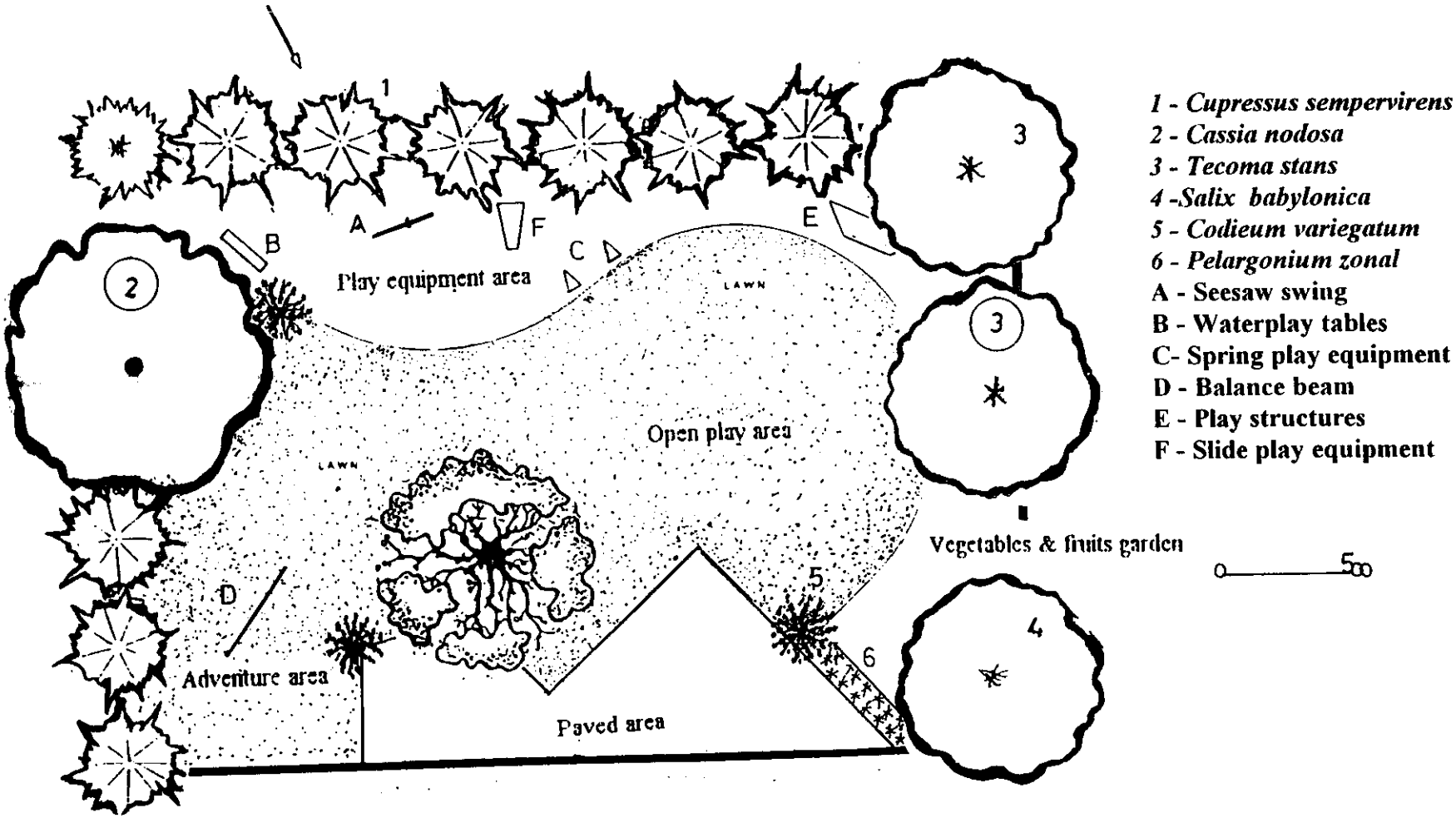


Figure 55 : A proposed design for kindergarten garden in an area 400 m .

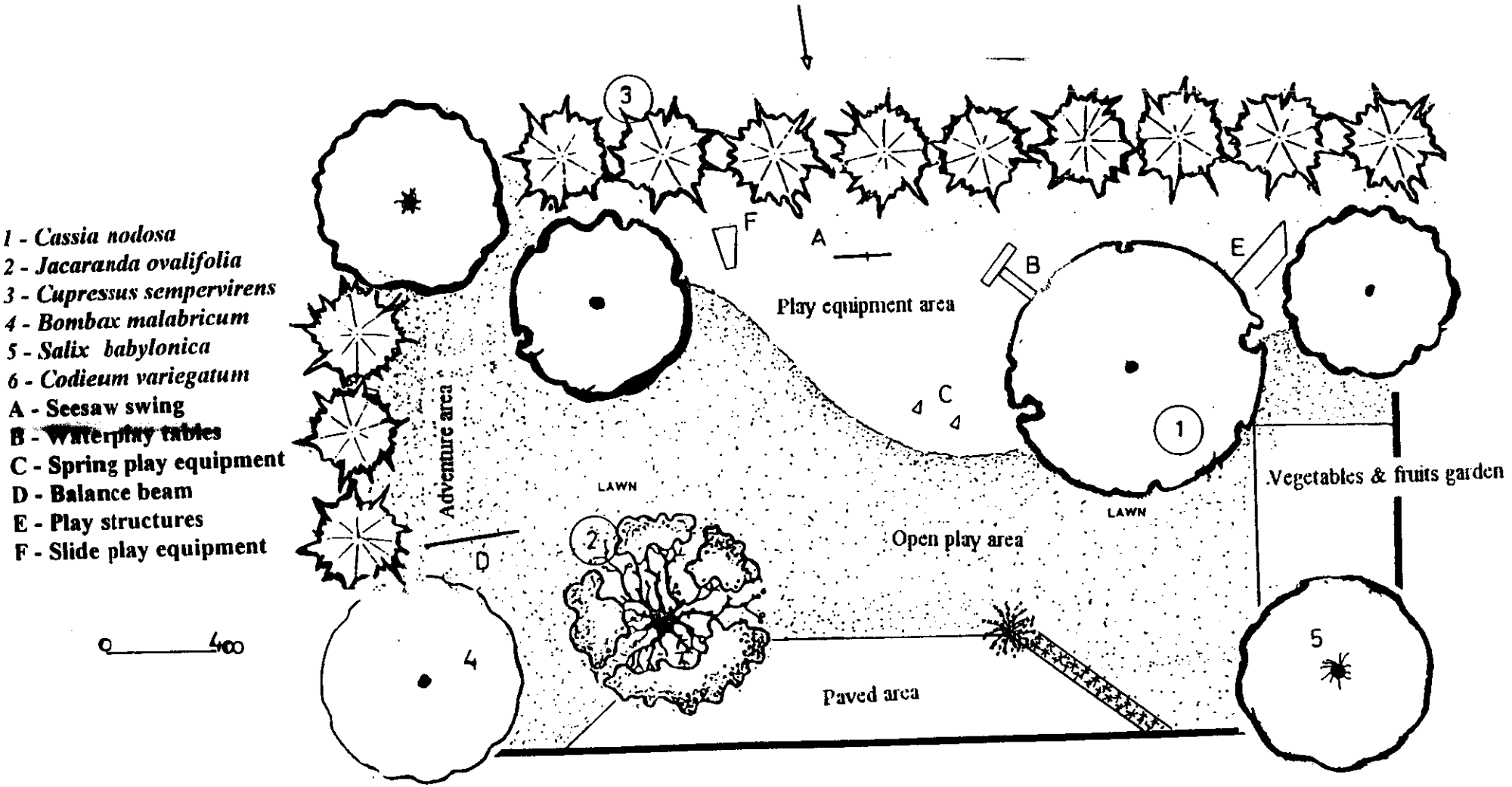


Figure 56 : A proposed design for kindergarten garden in an area 400 m .

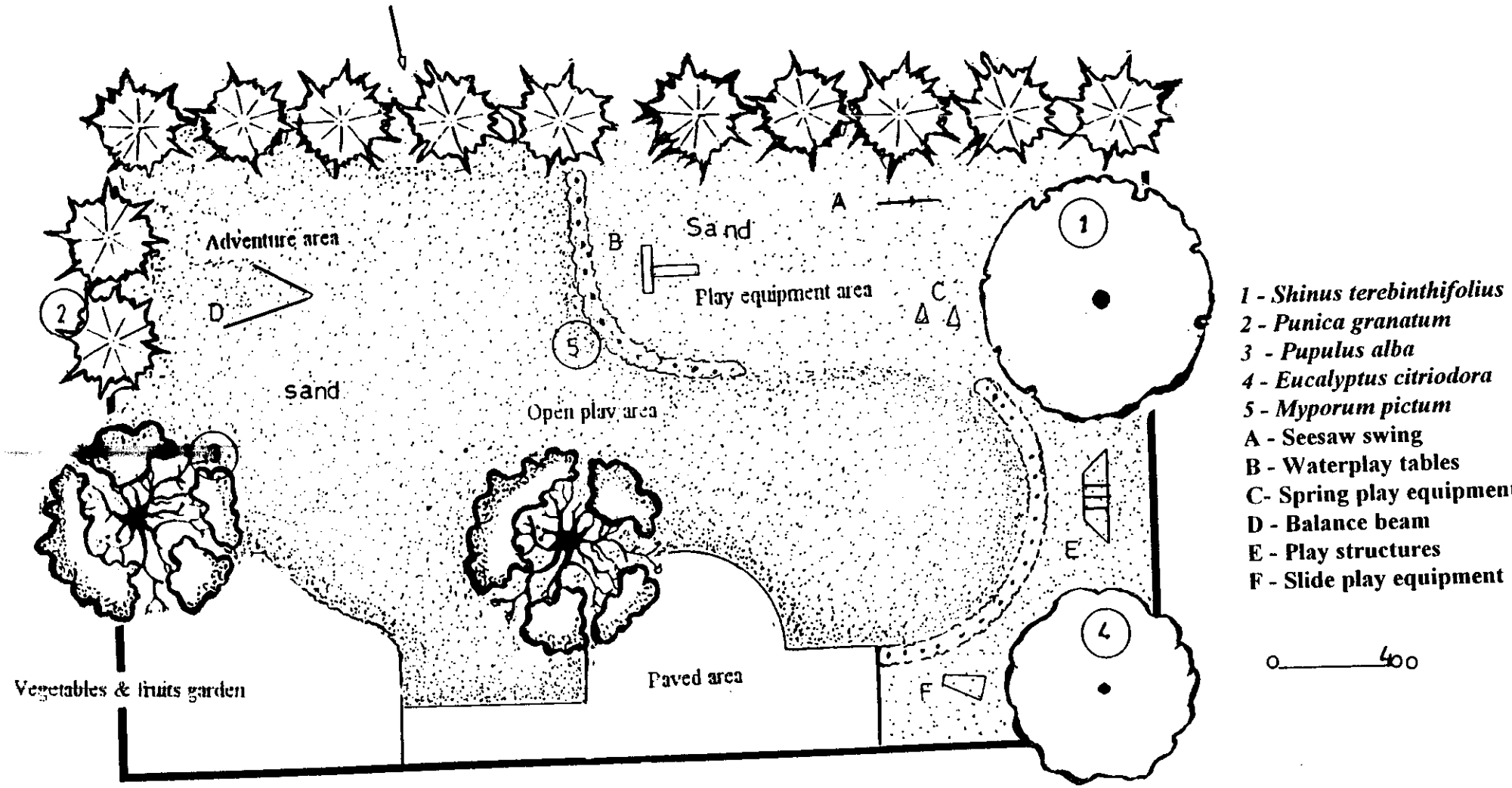
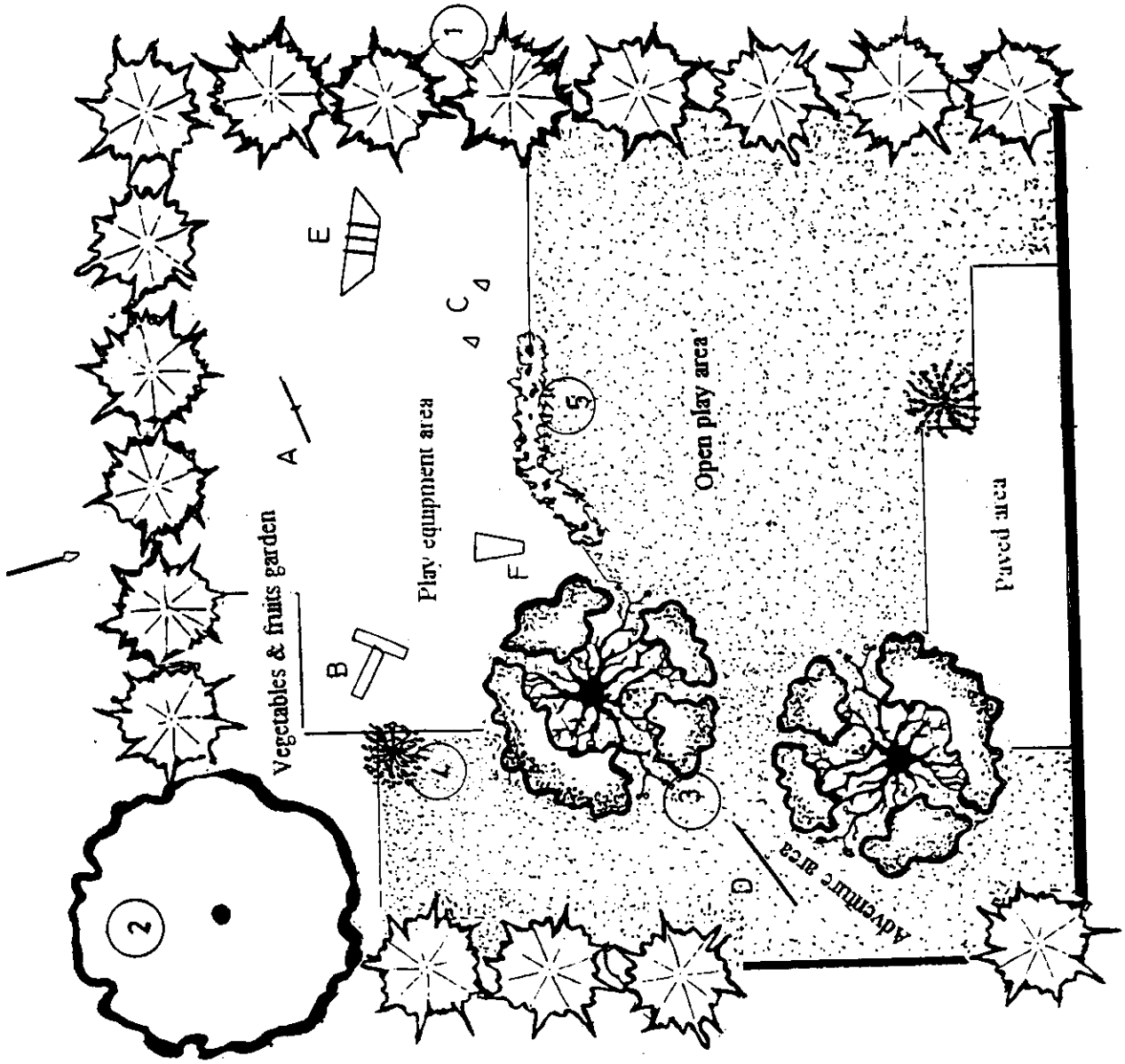


Figure 57 : A proposed design for kindergarten garden in an area 400 m.



1 - Cupressus sempervirens
2 - Cassia nodosa
3 - Jacaranda ovalifolia
4 - Codieum variegatum
5 - Hibiscus rosa sinensis
A - Seesaw swing
B - Waterplay tables
C- Spring play equipment
D - Balance beam
E - Play structures
F - Slide play equipment

Figure 58 : A proposed design for kindergarten garden in an area 400 m .

III - b) The study of the plant colors variation in the designed kindergarten : -

This part involved the study of color variation of the plants included in the garden . The results of color chanching due to leaves for trees in Table (9) , indicated that during the months of September . October and June gave the highest values , as (99,7 % , 96.3 % , 98,7 %) respectively , while the months of December , January , February and March gave the lowest values as (52.3 % , 50 % , 50 % , 51 %) respectively . The color of leaves during December , January , February and March due to the evergreen trees used in the design , Table (10) gave the highest values , such as *Picea pungens* , *Juniperus sp.* and *Citrus sp.* The deciduous trees such as *Acer palmatum atropurpurum* , *Magnolia soulangeana* and *Cercis sliquastrum* gave the lowest values .

The color due to leaves for shrubs used in the design in Table (11) , indicated that during the months of September , October , May and June , the color due to leaves gave the highest values as (100 % , 100 %, 94,7 % , 96.5 %) respectively . While during the remaining months gave the lowest values . The color of leaves for shrubs in the months of December , January , and February due to the evergreen shrubs , such as Buxus sempervirens , *Arbustus unedo* and *Aucuba japonica* , gave the highest values , While the deciduous shrubs such as *Viburnum opulus* table (10) gave the lowest values .

The color due to leaves for herbaceous which used in the design in Table (12), indicated that during the months of September , October , May and June , the color due to leaves gave the highest values as (100 % , 100 %) , while during the months of December and January the lowest values , were (85.2 % , 79.3) respectively .

The color of leaves for herbaceous plants used in the design during the months of January and February gave the lowest values, Table (12). The perennials gave the highest values of the color due the leaves , such as *Calluana vulgaris* , *Chrysanthemum frutescens* , *Hebe ochracea and Lavandula anagustifolia* , some annuals which used in the design gave the

lowest values , such as *Coreopsis grandiflora* and *Tagetes erecta* , (64.7 % , 57,3 %) respectively .

The color due to flowers of trees used in the design in Table (13), indicated that the trees flowered during the months of March , April , May and June . The flowers due trees gave the highest values through these months , (21.3 % , 30.7 % 38.7 % 16 %) respectively . The month of May was the best month for the color due to the flowers of trees , Table (10) .

Magnolia soulangeana gave the highest values of color, as (16.7 %) , while *Malus robusta* gave the lowest values (4.0 %), Table (10) .

The color due to flowers of shrubs used in the design , Table (14) indicated that the month of June was the best month for the shrubs flowering , (36.0 %) . This was followed by the month of May which gave (28.7 %) .The months of September , October and November gave the least values as (1.33 % , 0.0 % , 3.3 %) respectively .

Jasminium nudiflorum gave the highest value as (16.7 %) , while *Viburnum opulus* gave the lowest value as (2.0 %) for color due to flower color Table (10) .

The color due to the flowers of herbaceous used in the design, in Table (15) indicated that during the month of June the highest value for the color of the flowers was (39.6 %) . The months of December and January had the lowest values as (3.1 % , 6.2) , respectively .

Calluana vulgaris gave the highest value for the color due to flowers as (28.7 %) . This was followed by *Begonia semperflorens Tagets erecta* , *Pelargonium Zonal* , *Salvia superba* (27.7 % , 21.3 %, 20.7% ,20.0 %) respectively . *Gerbera jamesonii* gave the lowest value as (9.3 %) .

One of the most cherished qualities of the garden is its seasonsal display of color . The leaves are the most numerous and prominent components of the trees . The deciduous trees in the design display bold and attractive autumn color before shedding . Compared to the foliage , the flowers of the

trees are temporary feature and often of rather short duration , but they can be very decorative when open . the flowers which open before leaves unfold in spring such as *Magnolia soulangeana* and *Cercis serualta* , they are particularly striking and give attractive color to the garden .

The color due to fruits of some plants used in the design , Table (16) indicated that the months of September , October and November had the highest values for the color due to fruits as (79.3% , 83.3 % , 73.3 %) respectively , while the remaining of the months had the lowest values .

Citrus limon toscano, Citrus fortunella and *Citrus mereniii* gave the highest values as (100 %) for color due to fruits through the months of the study . *Aucuba japonica* gave the lowest values of color due to fruits as (10.0 %) .

The color of fruits through the months September , October , November and December gave the color for the garden when the garden is poor in color . Winter colors tended to be more stark , bark colors and their variation will be more noticeable and will accent by the colors of the persistent fruits, along the greens of the evergreens .

The plants materials which used gave the design all the basic colors (red , orange , yellow , green , blue green blue and violet) . Green color painted the design by the most colors of the leaves of trees , shrubs , herbaceous and lawns .

There is alomst an infinite variety of greens in the leaves . Even in one species the green change from the light , fresh color of an emerging new leaf in spring to the dark tones of midsummer and change completely from green to another color when fall arrives .The garden picture is always fantastic all the year around .

The leaves of *Acer platanoides* , *Acer palmatum atropurpurum* , the flowers of *Magnolia soulangeana* , *Prunus serulata* , *Cercis sliquastrum* , *Buddlia davidii* , *Begonia semperflorens* , and the fruits of *Punica granatum* , *Viburnuum opulus* , and *Cotoneaster detatus* achieved the red color in the design .

The flowers of *Ceanothus detatus* and *Coreopsis grandiflora* was covered the orange color in the design .The flowers of *Laburnum anagyroides* , *Hamamelis molis* , *Fosythia ovata* , *Gazania splendens* and the fruits of *Citrus sp.* And *Diopyros kaki* achieved the yellow color in the design .

The leaves of *Hosta lancifolia* achieved the blue green color in the design . The leaves of *Picea pungens* , *Juniperus squamata* , the flowers of *Salvia superba* , *Lavandula anagustifolia* and *Wisteria sinensis* achieved the blue color in the design . The flowers of *Calluana vulgaris* achieved the violet color in the design .

Reds , oranges and yellows are considered warm colors and seem to advance toward the viewer . Greens and blues are cooler colors and tend to recede in a composition . Blue as cool color was used as a background color in the compositions made by several colors . Nature's colors are nearly always superior compared to those manufactured by man and are subtler . Designer must be sensitive to color and knows how to utilize it as one of the variables in the designing landscaping .

Children have a natural love of color and respond spontaneously to it . Color is necessary in children's environments for reasons other than their own preference . For the optimal learning and development of children , it is vital that the environment provide a variety of stimulation . Color plays an important part in providing this necessary stimulation , most obviously and directly in stimulating a child's physical senses .

From the above results , it could be concluded that it is very important to choose and select the plants which may be preferly used in the landscape of the kindergarten garden . Such plants must realize all the objects they are chosen for , trees to provide color , shade and picturesque , shrubs in dividually or collectively will add beauteful effects . Where as the herbaceous plants have great importance espcially in restricted areas (small ones) to offer variation of colors . Whatever , the choise will continue the framing of the building and endly they will fulfill all the points studied in this thesis .

Table 9 : Means of color due to the leaves of trees

Plant \ Month	9	10	11	12	1	2	3	4	5	6	$\overline{X}$
1- Carpinus betulus pyramidalis	100.0	100.0	60.0	6.7	0.0	0.0	6.7	40.0	93.3	100.0	50.70 b
2- Acer pseudoplatonus leopoldii	100.0	100.0	60.0	6.7	0.0	0.0	0.0	40.0	86.7	100.0	49.30 b
3- Magnolia soulangeana	100	93.3	40.0	0.0	0.0	0.0	0.0	6.7	60.0	100.0	40.00 b
4- Acer platanoides	100.0	100.0	53.3	0.0	0.0	0.0	0.0	6.7	60.0	93.3	41.30 b
5- Prunus serulata	100.0	100.0	80.0	20.0	0.0	0.0	0.0	0.0	20.0	80.0	40.00 b
6- Cercis sliquastrum	100.0	100.0	53.3	0.0	0.0	0.0	0.0	40.0	86.7	100.0	48.00 b
7- Laburmum anagyroides	100.0	93.3	40.0	0.0	0.0	0.0	0.0	40.0	80.0	100	45.30 b
8- Diospyros kaki	93.3	40	6.7	0.0	0.0	0.0	0.0	40	86.7	100	36.70 b
9- Malus robusta	100.0	100.0	60	6.7	0.0	0.0	0.0	60	73.3	100	50.70 b
10-Thuja orientalis	100	100	100	100	100	100	100	100	100	100	100.0 a
11-Picea pungens	100	100	100	100	100	100	100	100	100	100	100.0 a
12-Juniperus communis	100	100	100	100	100	100	100	10	100	100	100.0 a
13-Juniperus pfitizerian	100	100	100	100	100	100	100	100	100	100	100.0 a
14-Juniperus squamata	100	100	100	100	100	100	100	100	100	100	100.0 a
15-Acer palmatum atropurpurum	100	100	53.3	6.7	0.0	0.0	6.7	46.7	93.3	100	50.70 b
16-Juniperus verginiana	100	100	100	100	100	100	100	100	100	100	100.0 a
17-Juniperus horizontalis	100	100	100	100	100	100	100	100	100	100	100.0 a
18-Citrus limon toscano	100	100	100	100	100	100	100	100	100	100	100.0 a
19-Citrus fortunella japonica	100	100	100	100	100	100	100	100	100	100	100.0 a
20-Citrus mirenii	100	100	100	100	100	100	100	100	100	100	100.0 a
$\overline{X}$	**99.7 a**	**96.3 a**	**75.3 bc**	**52.3 d**	**50.0 d**	**50.0 d**	**51.9 d**	**66.0 c**	**87.0 ab**	**98.7 a**	**72.6**

* Datauntransformed

Table 11 : Mean of color due the leaves of shrubs

Plant \ Month	9	10	11	12	1	2	3	4	5	6	$\bar{X}$
1- Punica granatum	100.0	86.70	40.00	6.700	00.00	00.00	00.00	40.00	80.00	100.0	45.3 cd
2- Viburnum opulus	100.0	60.00	13.30	00.00	00.00	00.00	00.00	33.30	66.70	100.0	37.30 d
3- Aucuba japonica	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
4- Corlylus maxima purpura	100.0	93.30	40.00	00.00	00.00	00.00	00.00	40.00	73.30	100.0	44.7 cd
5- Hamamelis molis	100.0	100.0	80.0	20.00	00.00	00.00	00.00	20.00	73.30	100.0	49.3 bcd
6- Arbustus unedo	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
7- Jasminium nudiflorum	100.0	93.30	60.00	6.700	00.00	00.00	00.00	33.30	73.30	100.0	46.7 bcd
8- Hydrangea macrophylla "Rosabelle"	100.0	100.0	86.70	80.00	80.00	80.00	93.30	100.0	100.0	100.0	92.00 a
9- Chamaecyparis lawsoniana	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
10- Ceanothus detatus	100.0	80.0	40.0	6.700	00.00	00.00	00.00	20.00	73.30	100.0	42.0 cd
11- Wisteria sinensis	100.0	100.0	100.0	60.00	00.00	00.00	6.700	53.30	93.30	100.0	61.30 b
12- Cotoneaster horizontalis	100.0	100.0	73.30	26.70	00.00	00.00	00.00	40.00	73.30	100.0	51.3 bc
13- Osmantus aquifolium	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
14- Forsythia ovata	100.0	93.30	46.70	13.30	00.00	00.00	00.00	33.30	73.30	100.0	46.0 cd
15- Buxus sempervirens	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
16- Cytisus ibriidii	100.0	100.0	66.70	20.00	6.00	6.00	60.00	60.00	6.70	100.0	52.0 cd
17- Azalea cauche "Sun vallye"	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
18- Buddleia daviddi "Ile de france"	100.0	100.0	60.00	13.30	00.00	00.00	00.00	13.30	60.00	100.0	44.7 cd
19- Hibiscus rosa sinensis "Paramaribo"	100.0	100.0	100.0	13.30	46.70	40.00	66.70	93.30	100.0	100.0	82.00 a
20- Hedera canariensis	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
$\bar{X}$	**100.0 a**	**95.30 a**	**75.30 bc**	**51.30 d**	**41.30 e**	**41.30 e**	**46.30 de**	**64.00 c**	**82.30 ab**	**100.0 a**	**69.70**

* Datauntransformed

Table 12 : Mean of color due to the leaves of [illegible]

Plant \ Month	9	10	11	12	1	2	3	4	5	6	$\overline{X}$
1- Lanvandula anagustifolia	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
2- Poa pratensis	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
3- Hosta lancifolia	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
4- Hebe ochracea	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
5- pelargonium zonal "Irene"	100.0	100.0	60.00	13.30	00.00	00.00	100.0	26.70	100.0	100.0	58.70 b
6- Begonia semperflorens "Hybiden"	100.0	100.0	73.30	26.70	00.00	00.00	00.0	00.00	00.00	33.30	33.30 c
7- Gazania splendens "Sun beam"	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
8- Coreopsis grandiflora "Baden gold"	100.0	100.0	60.00	13.30	6.00	00.00	26.70	20.0	100.0	100.0	57.3 b
9- Salvia superba	100.0	100.0	100.0	100.0	100.0	00.00	00.00	100.0	100.0	100.0	100.0 a
10- Iris germanica	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
11- Alcea rosa "Rubra"	100.0	100.0	100.0	100.0	100.0	00.00	20.00	100.0	100.0	100.0	100.0 a
12- Chrysanthemum frutescens	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
13- Hemerocallis aurantica "Mikado"	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
14- Hosta seibeliana	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
15- Penstemom hartwegii	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
16- Calluana vulgaris	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
17- Companula medium	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 a
18- Gerbere jamesonii "Juli"	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	64.7 b
19- Tagetes erecta "Inca"	100.0	100.0	100.0	66.70	6.70	6.000	6.700	60.00	100.0	100.0	
$\overline{X}$	**100.0 a**	**100.0 a**	**94.3 bc**	**85.2 bcd**	**79.30 d**	**78.90 d**	**81.80 cd**	**90.80 abc**	**94.70 a**	**96.50 a**	**90.20**

* Datauntransformed

Flowers (Trees)

Table 13 : Mean of color due to the flowers of trees

Month / Plant	9	10	11	12	1	2	3	4	5	6	$\overline{X}$
1- Magnolia soulangeana	0.00	0.00	0.00	0.00	0.00	0.00	40.0	86.7	40.0	0.00	16.7 a
2- Prunus serulata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53.3	73.3	6.70	13.3 a
3- Cercis sliquastrum	0.00	0.00	0.00	0.00	0.00	0.00	66.7	6.70	0.00	0.00	7.30 b
4- Laburmum anagyroides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.70	80.0	33.3	12.0 a
5- Malus robusta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.0	4.00 c
$\overline{X}$	**0.0 b**	**0.0 b**	**0.0 b**	**0.0 b**	**0.0 b**	**0.0 a**	**21.3 a**	**30.7 a**	**38.7 a**	**16.0 a**	**10.7**

* Data Untransfored

Flowers (Shrubs)

Table 14 : Mean of color due the flowers of shrubs .

Plant \ Month	9	10	11	12	1	2	3	4	5	6	$\overline{X}$
1- Punica granatum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7	60.0	6.70 b
2- Viburnum opulus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	2.00 c
3- Hamamelis molis	0.0	0.0	0.0	0.0	20	80.0	33.3	0.0	0.0	0.0	13.30 a
4- Jasminium nudiflorum	0.0	0.0	0.0	0.0	73.3	73.3	13.3	0.0	0.0	0.0	16.7 a
5- Hydrangea macrophylla "Rosabelle"	0.0	0.0	0.0	6.7	0.0	0.0	0.0	6.7	73.3	80.0	16.0 a
6- Ceanothus detatus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.7	86.7	13.3	14.7 a
7- Wisteria sinensis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.7	93.3	14.0 a
8- Forsythia ovata	0.0	0.0	0.0	0.0	6.7	73.3	66.7	0.0	0.0	0.0	14.7 a
9- Cytisus ibriidii	0.0	0.0	0.0	0.0	0.0	6.70	60.0	60	6.7	0.0	13.3 a
10- Azalea cauche "Sun valley"	0.0	0.0	33.3	93.3	6.7	0.0	0.0	0.0	0.0	0.0	13.3 a
11- Buddleia davidii "Ile de france"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	80	10.0 b
12- Hibiscus rosa sinensis "Paramaribo"	13.3	0.0	0.0	0.0	0.0	0.0	0.0	13.3	46.7	93.3	15.67 a
$\overline{X}$	**1.33 d**	**0.00 d**	**3.30 d**	**10.0 cd**	**10.70 cd**	**23.30 bc**	**17.30 bcd**	**12.70 bcd**	**28.70 ad**	**36.00 a**	**16.40**

* Data Untransfored

Flowers (Herbaceous)

Table 15 : **Means of color due to flowers for Herbaceous**

Plant \ Month	9	10	11	12	1	2	3	4	5	6	$\overline{X}$
1- Lavandula anagustifolia	100	80.0	46.7	6.70	0.00	0.00	0.00	0.00	0.00	0.00	23.3 a
2- Pelargonium zonal "Irene"	0.0	0.00	0.00	0.00	0.00	0.00	0.00	20.0	80.0	100	20.0 a
3- Begonia semperflorens "Hybiden"	100	93.3	53.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.7 a
4- Gazania splendens "Sun beam"	60	6.70	0.00	0.00	0.00	0.00	0.00	0.00	6.70	46.7	12.1 b
5- Coreopsis grandiflora "Baden gold"	40	6.70	0.00	0.00	0.00	0.00	0.00	0.00	40.0	86.7	17.3 b
6- Salvia superba	73.3	33.3	6.70	0.00	0.00	0.00	0.00	0.00	20.0	73.3	20.7 a
7- Iris germanica	0.0	0.00	0.00	0.00	0.00	46.7	73.3	0.00	0.00	0.00	12.0 c
8- Alcea rosa "Rubra"	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.0	93.3	13.3 b
9- Chrysanthemum frutescens	0.0	0.00	0.00	0.00	0.00	0.00	0.00	33.3	80.0	20.0	13.3 b
10- Hemerocallis aurantica "Mikado"	93.3	46.7	6.70	0.00	0.00	0.00	0.00	0.00	0.00	46.7	19.3 a
11- Penstemom hartwegii	0.0	0.00	0.00	0.00	0.00	0.00	6.70	53.3	60.0	0.00	12.0 b
12- Calluana vulgaris	0.0	0.00	13.3	40.0	93.3	93.3	46.7	0.00	0.00	0.00	28.7 a
13- Companula medium	0.0	0.00	0.00	0.00	0.00	0.00	0.00	20.0	86.7	46.7	15.3 b
14- Gerbere jamesonii "Juli"	13.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.3	66.7	9.3 c
15- Tagetes erecta "Inca"	100	66.7	33.3	0.00	0.00	0.00	0.00	0.00	0.00	13.3	21.3 a
$\overline{X}$	**38.7 ab**	**22.2 bc**	**10.7 cd**	**3.10 d**	**6.20 d**	**9.30 cd**	**8.40 cd**	**8.40 cd**	**28.4 ab**	**39.6 a**	**17.5**

* Data Untransfored

Table 16 .: **Means of color due to fruits**

Plant \ Month	9	10	11	12	1	2	3	4	5	6	$\overline{X}$
1- Diospyros kaki	86.7	100	80.0	33.3	6.70	0.00	0.00	0.00	0.00	0.00	30.1 b
2- Malus robusta	73.3	100	80.0	6.70	0.00	0.00	0.00	0.00	0.00	0.00	26.0 b
3- Punica granatum	93.3	60.0	26.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.0 bc
4- Viburnum opulus	80.0	93.3	60.0	13.3	0.00	0.00	0.00	0.00	0.00	0.00	24.7 b
5- Aucuba japonica	80.0	20.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.0 c
6- Arbustus unedo	33.3	80.0	93.3	33.3	0.00	0.00	0.00	0.00	0.00	0.00	24.0 b
7- Cotoneaster horizontalis	46.7	80.0	93.3	33.3	0.00	0.00	0.00	0.00	0.00	0.00	25.3 b
8- Citrus limon toscano	100	100	100	100	100	100	100	100	100	100	100 a
9- Citrus fortunella japonica	100	100	100	100	100	100	100	100	100	100	100 a
10- Citrus merenii	100	100	100	100	100	100	100	100	100	100	
$\overline{X}$	**79.3 a**	**83.3 a**	**73.3 a**	**42.0 b**	**30.7 c**	**30.0 c**	**30.0 c**	**30.0 c**	**30.0 c**	**30.0 c**	**45.8**

* Data Untransfored

Table 4: Color of plants used for planting design

Plant	Color due to *			September			October.			November.			December			January			Febrauary			Mars.			April.			May.			June.		
	Leaves	Flowers	Fruits	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30
1- *Carpinus betulus pyramidalis*																																	
2- *Acer pseudoplatonus leopoldii*																																	
3- *Magnolia soulangeana*																																	
4- *Acer platanoides*																																	
5- *Prunus serulata*																																	
6- *Cercis sliquastrum*																																	
7- *Laburmum anagyroides*																																	
8- *Diospyros kaki*																																	
9- *Malus robusta*																																	
10- *Thuja orientalis*																																	
11- *Picea pungens*																																	
12- *Juniperus communis*																																	
13- *Juniperus pfitizerian*																																	
14- *Juniperus squamata*																																	
15- *Acer palmatum atropurpurum*																																	
16- *Juniperus verginiana*																																	
17- *Juniperus horizontalis*																																	
18- *Citrus limon toscano*																																	

* **Exotica A3. (Alfred B. Graf. 1970).**

Table 10 : color of plants used for planting design

Plant	Color due to ★			September			October.			November.			December			January			Febrauary.			Mars.			April.			May.			June.		
	Leaves	Flowers	Fruits	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30
19- Citrus fortunella japonica																																	
20- Citrus merenii																																	
21- Punica granatum																																	
22- Viburnum opulus																																	
23- Aucuba japonica																																	
24- Corlylus maxima purpura																																	
25- Hamamelis molis																																	
26- Arbustus unedo																																	
27- Jasminium nudiflorum																																	
28- Hydrangea macrophylla "Rosabelle "																																	
29- Chamaecyparis lawsoniana																																	
30- Ceanothus detatus																																	
31- Cotoneaster horizontalis																																	
32- Osmantus aquifolium																																	
33- Forsythia ovata tropurpurum																																	
34- Buxus sempervirens																																	
35- Cytisus ibriidii																																	

* **Exotica A3. (Alfred B. Graf. 1970).**

Table 10 : color of plants used for planting design

Plant	Color due to ★			September			October.			November.			December			January			Febrauary.			Mars.			April.			May.			June.		
	Leaves	Flowers	Fruits	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30
36- *Azalea cauche* **"Sun valley"**																																	
37- *Buddleia davidii* **"Ile de france"**																																	
38-*Hibiscus rosa sinensis* **"Paramaribo"**																																	
39- *Wisteria sinensis*																																	
40- *Hedera canariensis*																																	
41-*Coreopsis grandiflora* **"Baden gold"**																																	
42- *Salvia superba*																																	
43- *Iris germanica*																																	
44- *Tagetes erecta* **"Inca"**																																	
45-*Alcea rosa* **"Rubra"**																																	
46- *Gazania splendens* **"Sun beam"**																																	
47- *pelargonium zonal* **"Irene"**																																	
48- *Hemerocallis aurantica* **"Mikado"**																																	
49- *lavandula anagustifolia*																																	
50- *Hosta lancifolia*																																	
51- *Hosta seibeliana*																																	
52- *Penstemom hartwegii*																																	
53- *Calluana vulgaris*																																	

* **Exotica A3. (Alfred B. Graf. 1970).**

Table 1 : color of plants used for planting design

Plant	Color due to ★			September.			October.			November.			December			January			Febrauary.			Mars.			April.			May.			June.		
	Leaves	Flowers	Fruits	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30
54- *Companula medium*																																	
55- *Hebe ochracea*																																	
56- *Begonia semperflorens* **"Hybiden"**																																	
57- *Chrysanthemum frutescens*																																	
58- *Gerbera jamesonii* **"Juli"**																																	
Lolium perenne																																	
59- *Poa pratensis*																																	
Festuca rubra																																	

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