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POLLEN STRUCTURE IN SELECTED SPECIES OF MAHARAJA KRISHNAKUMASINHJI BHAVNAGAR UNIVERSITY, BHAVNAGAR DISTRICT, GUJARAT STATE, INDIA

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ABSTRACT
Palynology, scientific discipline concerned with the study of plant pollen. Pollens are male reproductive cells in plants, very tiny grains produced by the stamens of flower. Pollen represents the land flora and can be used in many different disciplines. Pollen can be used to determine pollination mechanisms, therapeutic activity and source zone of pollinators. The present investigation deals with the study of pollen taxa of Twenty (20) species of Maharaja Krishnakumasinhji Bhavnagar University, Bhavnagar, and Gujarat, India. These pollen taxa belong to seventeen (17) different families. The pollen of these families has diversity in morphological characters viz, shape, attachment of filament, type of pollen and ornamentation. This study provides Palynological data of pollen taxa, which will helpful in future

Keywords: *Pollen structure, shape, Palynology, Bhavnagar*

INTRODUCTION
Maharaja Krishnakumasinhji Bhavnagar University located at middle of Bhavnagar city in Bhavnagar district of Saurashtra region of Gujarat state of India. Bhavnagar is coastal city on eastern coast of Saurashtra, located at 21.7° N 72.15° E and is surrounded by Botad and Ahmadabad in north, Amreli in west and Gulf of Khambhat in South and East. It has Dry scrub forest with diversity in flora.

The present study reveals the pollen diversity and morphological characteristics of related species. Palynology is the study of pollen. Also pollen morphology is useful to identify and characterization of plant species for taxonomic purpose pollen morphological structure show variation due to its typical character (figure printing) and chemical composition. Palynological studies are not only useful in taxonomy but also to know explorative plants by means of Melissopalynology studies. The pollen architecture is a unique feature in plant morphological identification and thus finds imperative implication in plant taxonomy. The microscopic structure of male gametophyte is secured inside an outer exine made up of sporopollenin.

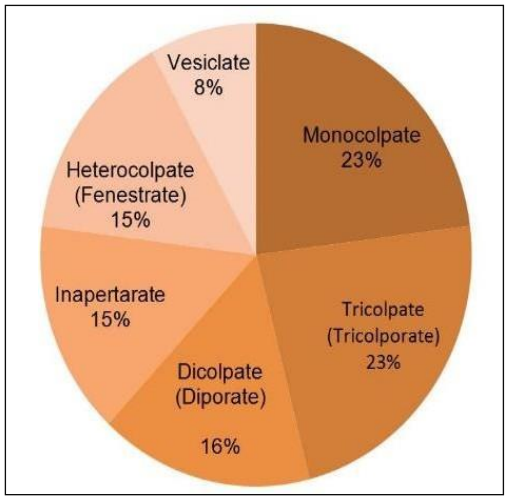
MATERIALS AND METHODS
Materials:
The material for the present investigation has been collected from various places Maharaja Krishnakumasinhji University campus area Bhavnagar. The material is to be collected the freshly opened materials of the flower which have been collected. Anther is removed with the help of clean forceps and modernly fix into 70% alcohol.

Methodology:
Slides were prepared to observe under the microscope according to method describe by Nair (1970), polled grains are treated for acetolysed and non- acetolysed on the slides. The acetolysis method is still highly successful technique in palynology. Acetic acid destroys material with the exception of sporopollenin that forms the outer exine wall. The pollen grain which not acetolysed in 70% acetic acid. The plant material which not acetolysed that

unacetolysed by 90% alcohol method in which the polliniferous material were crushed in alcohol and sieved (Erdtman G. 1960) The pollen grain was stained with safranin & acetocarmine stain and observes under microscope (Bolick, M. R. 1978). Anthers structures were studied with the help of stereo microscope and Pollen materials were studied under a light microscope.

RESULT & DISCUSSION

Angiosperm plants at Maharaja Krishnakumasinhji university area including indigenous, cultivated and naturalized plants. The study area shows pollen diversity comprises of 20 species belong to 17 angiosperm families. The following table. No 1 gives the type of pollen, symmetry, number of stamens, cohesion of stamens, and attachment of filament with anther lobe. (Figure 1) gives the percentage of pollen and (Figure 2) gives the percentage of diversity in stamen with the help of above observation various type of pollen grains having difference in their morphology. Onthe basis of types of lobe which present on symmetry among that Heterocolpate, Monocolpate andTricolpate type of pollen grains are majorly found from my study area. According to pollen descriptions from pollen grains, their structure, identification and significance in science by R. P. Wodehouse (1935) the present study show, *Agave Americana L.* (plate 1, Sr. 1) in that the pollen has bilateral symmetry, on the basis of range of aperture number, position and character this speciescontains one Lobe Monocolpate and monodelphous cohesion of stamens(Erdtman 1952). *Calliandra haematocephala L.* (plate 1, Sr. 2) in that the pollen has radial symmetry, Vesiclate type of pollen and monodelphous cohesion of stamens. *Callistemon viminalis L.* (plate 1, Sr. 3) that pollen has bilateral symmetry, Dicolpate type of pollen and monodelphous cohesion of stamens. *Celosia argentea L.* (plate 1, Sr. 4) has Bilateral type of symmetry, Inapertarate type of pollen and monodelphous cohesion of stamens. *Commelina benghalensis L.* (plate 1, Sr. 5) that pollen has radial symmetry, Heterocolpate type of pollen and monodelphous cohesion of stamens. *Crinum asiaticum L.* (plate 2, Sr. 6) that pollen has bilateral symmetry, Heterocolpate type of pollenand monodelphous cohesion of stamens (Jameela *et al.*, 2014)). *Dahlia variabilis L.* (plate 2, Sr. 7) that pollen has radial symmetry, Heterocolpate type of pollen and Syngenesious cohesion of stamens. *Duranta repens L.* (plate 2, Sr. 8) has bilateral, inaperture type of pollen and didynamouscohesion of stamens. *Euphorbia mili L.* (plate 2, Sr. 9) that pollen has bilateral symmetry, inaperture type of pollen and syngenesious cohesion of stamens. *Hibiscus rosa sinensis* L (plate 2, Sr. 10) that pollen has bilateral symmetry, heterocolpate type of pollen and monodelphous cohesion of stamens (Arora *et al.,* 2014). *Ipomoea purpurea L.* (plate 3, Sr. 11) has radial symmetry and heterocolpate type of pollen and monodelphous cohesion of stamens. *Ixora coccinea L.* (plate 3, Sr. 12) has bilateral symmetry and tricolpate type of pollen and monodelphouscohesion of stamens (A Lgersheim *et al,* 1990). *Jetropha integerrima L.* (plate 3, Sr. 13) has Bilateral type of symmetry, monocolpate type of pollen and didynamous cohesion of stamens. *Mimesa pudica L.* (plate 3, Sr. 14) has Radial type of symmetry, monocolpate type of pollen and monodelphous cohesion of stamens. *Ocimum canum L.* (plate 3, Sr. 15) has Radial type of symmetry, monocolpate type of pollen and monodelphous cohesion of stamens. *Portulaca oleracea L.* (plate 4, Sr. 16) has Radial type of symmetry, monocolpate type of pollen and adolphuscohesion of stamens. *Punica granatum L.* (plate 4, Sr. 17) Radial type of symmetry and heterocolpate type of pollen and adolphus cohesion of stamens. *Tacoma stans L.* (plate 4, Sr. 18)Bilateral type of symmetry, tricolpate type of pollen and monodelphous cohesion of stamens. *Tradescantia spathacea L.* (plate 4, Sr. 19) Radial type of symmetry, monocolpate type of pollen and monodelphous cohesion of stamens. *Tradeseantia pauida L.* Radial type of symmetry, inaperturate type of pollen and monodelphous cohesion of stamens.



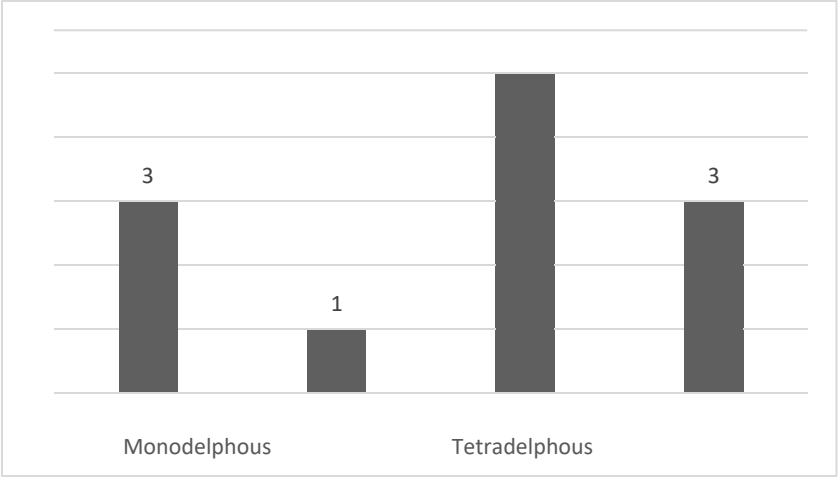
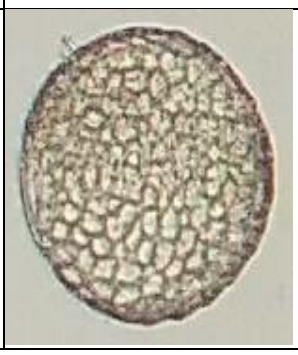


Figure – 1: Types of Pollen Figure – 2: Diversity of Stamen

Sr. no.	scientific Name	Family	No. of stamens	Cohesion of Stamens	Attachment of Filament with Anther Lobe	Type of Pollen	Symmetry
1	*Agave americanaL.*	Asparagaceae	Monoqndrous	Monodelphous	Versatile	Monocolpate	Bilateral
2	*Calliandra haematocephala L.*	Fabaceae	Polyandrous	Monodelphous	Basifixed	Vesiclate	Radial
3	*Callistemon viminalis L.*	Myrtaceae	Polyandrous	Monodelphous	Dorsifixed	Dicolpate (Diporate)	Bilateral
4	*Celosia argentea L.*	Amaranthaceae	Monoandrous	Monodelphous	Basifixed	Inapertarate	Bilateral
5	*Commelina benghalensis L.*	Commelinaceae	Tetraandrous	Monodelphous	Dorsifixed	Heterocolpate	Radial
6	*Crinum asiaticum L.*	Amaryllidaceae	Polyandrous	Monodelphous	Versatile	Heterocolpate	Bilateral

7	*Dahlia variabilis L.*	Asteraceae	Pentaandrous	Syngenesious	Basifixe d	Heterocolpate (Fenestrate)	Radial
8	*Duranta repens L.*	Verbenacea e	Pentaandrous	Didynamous	Adnate	Inapertarate	Bilater al
9	*Euphorbia mili L.*	Euphorbiaceae	Monoandrous	Syngenesious	Adnate	Dicolpate (Diporate)	Bilater al
10	*Hibiscus rosa sinensis L.*	Malvaceae	Polyandrous	Monodelphous	Basifixe d	Heterocolpate (Fenestrate)	Bilater al
11	*Ipomoea purpurea L.*	Convolvulaceae	Pentaandrous	Monodelphous	Dorsifixed	Heterocolpate	Radial
12	*Ixora coccinea L.*	Rabiaceae	Tetraandrous	Monodelphous	Basifixe d	Tricolpate (Tricolporate)	Bilater al
13	*Jetropha integerrima L.*	Euphorbiaceae	Pentaandrous	Didynamous	Dorsifixed	Monocolpate	Bilater al
14	*Mimesa pudica L.*	Fabaceae	Tetraandrous	Monodelphous	Basifixe d	Monocolpate	Radial
15	*Ocimum canum L.*	Lamiaceae	Pentaandrous	Monodelphous	Dorsifixed	Monocolpate	Radial
16	*Portulaca oleracea L.*	Portulacaceae	Polyandrous	Adolphus	Basifixe d	Monocolpate	Radial
17	*Punica granatum L.*	Punicaceae	Polyandrous	Adolphus	Basifixe d	Heterocolpate	Radial
18	*Tacoma stans L.*	Bignoniaceae	Pentaandrous	Monodelphous	Versatile	Tricolpate (Tricolporate)	Bilater al
19	*Tradescantia spathacea L.*	Commelinaceae	Polyandrous	Monodelphous	Versatile	Monocolpate	Radial
20	*Tradeseantia pauida L.*	Commelinaceae	Polyandrous	Monodelphous	Versatile	Inapertarate	Radial

Table 1 Showing Morphological characteristic of Anther & pollen

Sr. No.	Flower	Anther	Pollen
1			

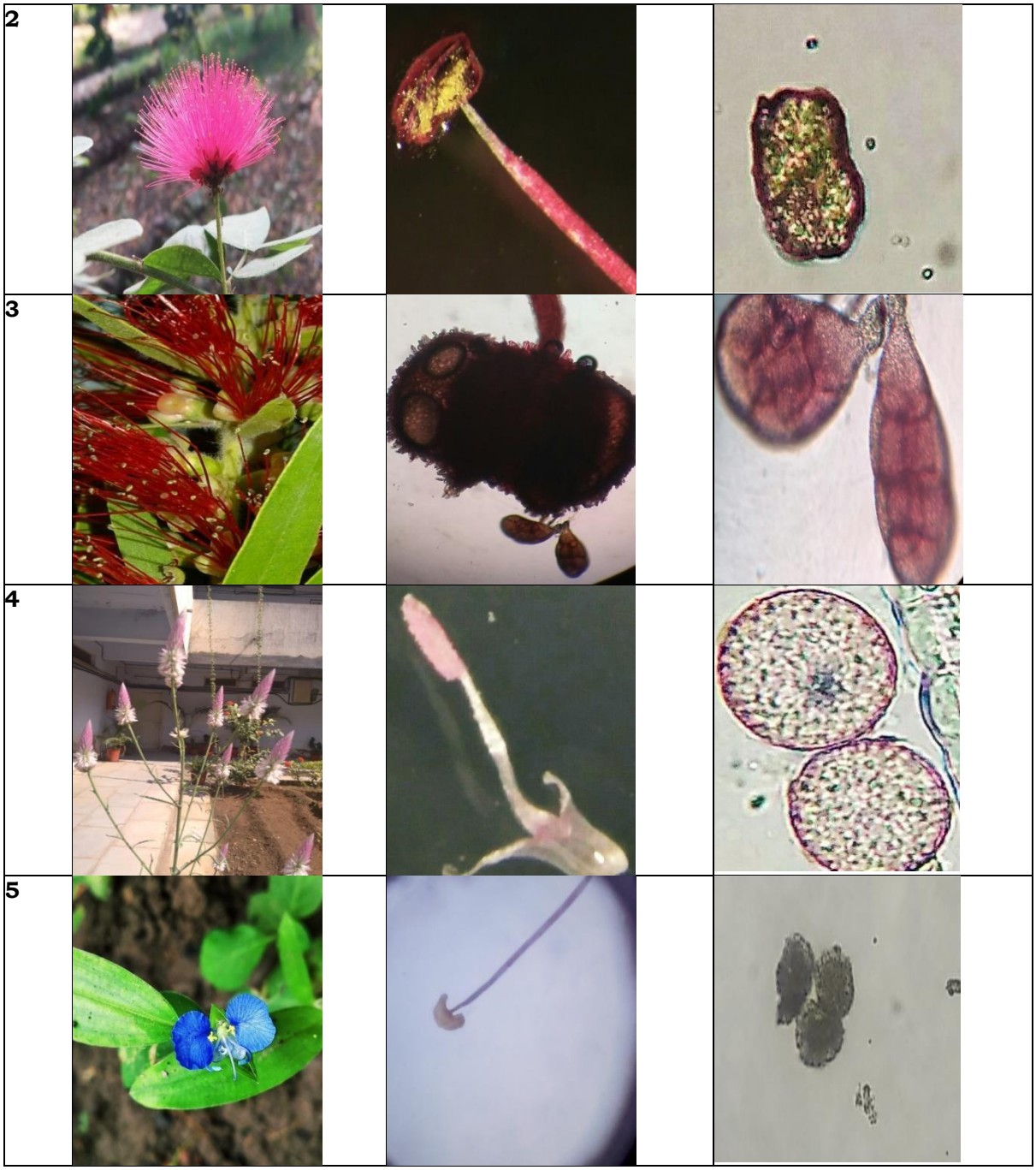


Plate No. 1 – 1. *Agave americana L.* 2. *Calliandra haematocephala L.* 3. *Callistemon viminalis*
L.4. Celosia argentea L. 5. Commelina benghalensis L.

Sr. No.	Flower	Anther	Pollen

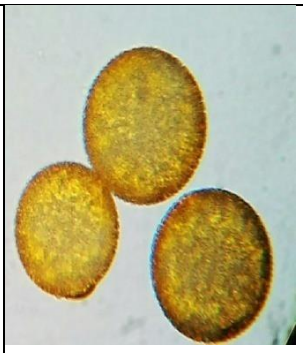
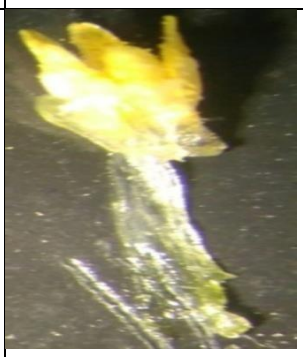
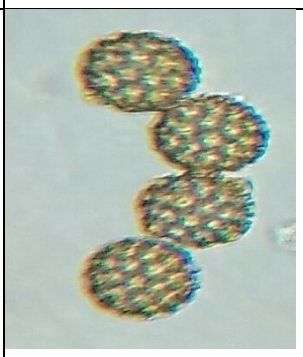
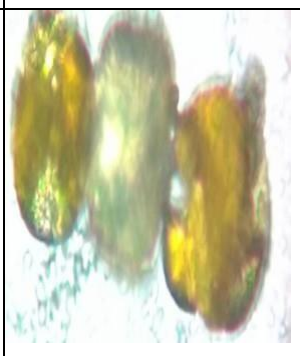
6			
7			
8			
9			

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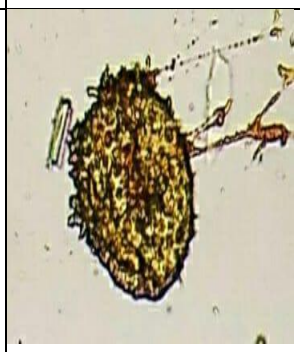
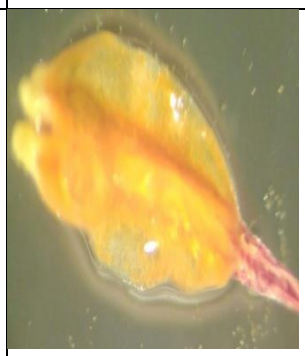
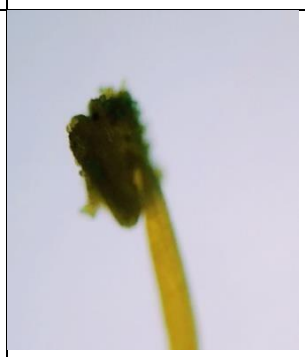
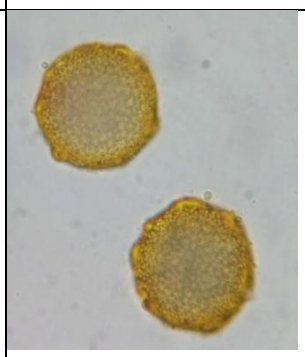
Plate No. 2 – 6. *Crinum asiaticum L.* 7. *Dahlia variabilis L.* 8. *Duranta repens L.*
9. Euphorbia mili L. 10. Hibiscus rosa sinensis L.

Sr. No.	Flower	Anther	Pollen
11			
12			
13			

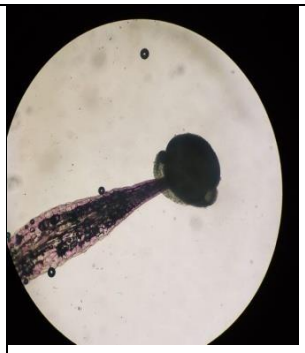
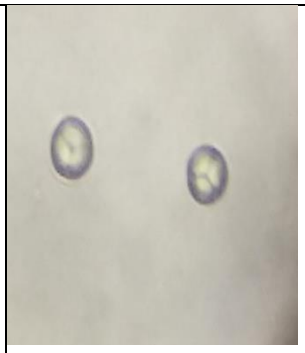
14			
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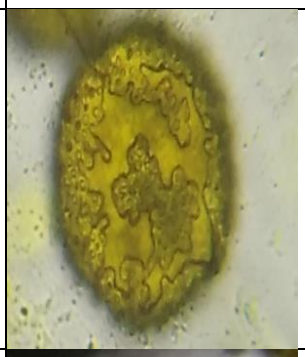
Plate No. 3 – 11. *Ipomoea purpurea L.* 12. *Ixora coccinea L.* 13. *Jetropha integerrima L.* 14.
Mimesa pudica L. 15. Ocimum canum L.

Sr. No.	Flower	Anther	Pollen
16			
17			

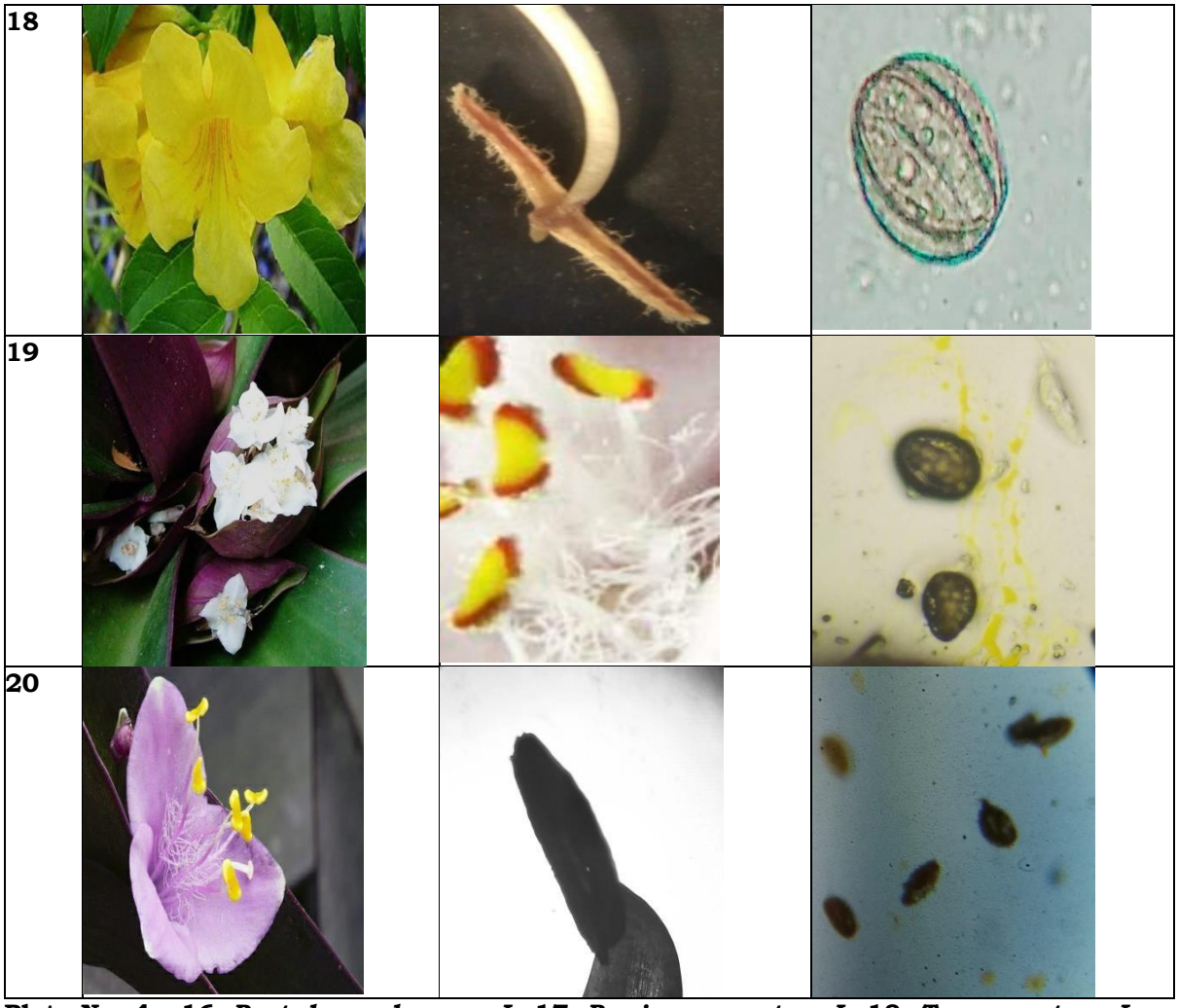


Plate No. 4 – 16. *Portulaca oleracea L.* 17. *Punica granatum L.* 18. *Tacoma stans L.* 19. *Tradescantia spathacea L.* 20. *Tradeseantia pauida L.*

CONCLUSION

The above observation various type of pollen grains having difference in their morphology such per its symmetry and lobs. Among that Ten (10) species have radial symmetry and Ten (10) specieshave bilateral symmetry in which Heterocolpate, Monocolpate and Tricolpate type of pollen grainsare majorly found from area. So that this morphological analysis further useful in therapeutic activity and allergen pollen assay to determine.

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