Sustainable Medical Technologies

Tackling Chikungunya through Ayurveda- a sustainable medication

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Abstract

Chikungunya disease is becoming a global threat, Primarily affecting third world- affordability issue.

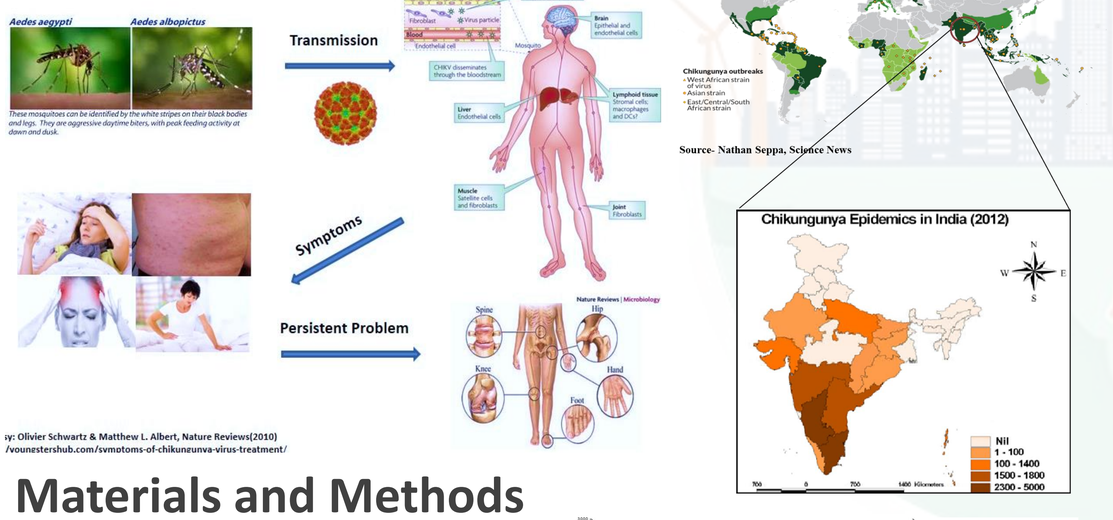
Re-emergence & sporadic incidence.

No Approved therapeutics.

Ayurvedic literature review and screening of medicinal herbs for anti-chikv activity.

Molecular mechanism of inhibition and antiviral activity is deciphered.

Introduction



y: Olivier Schwartz & Matthew L. Albert, Nature Reviews(2010)
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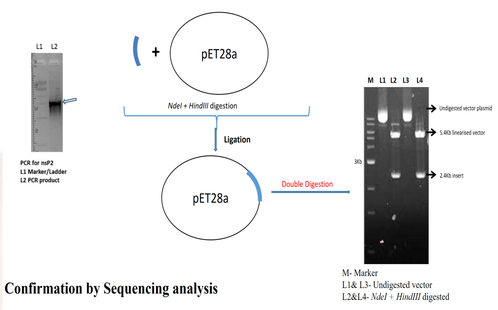
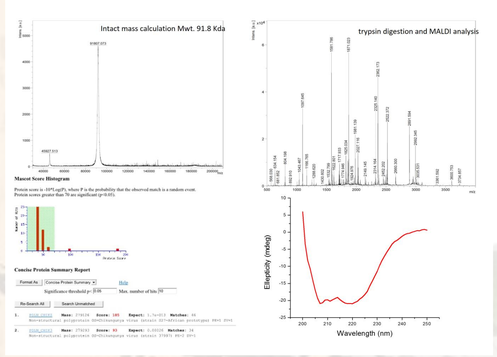
Materials and Methods

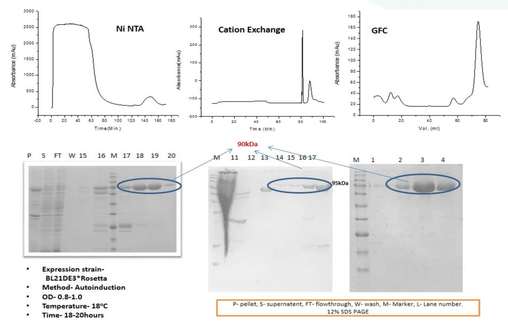


Confirmation by Sequencing analysis

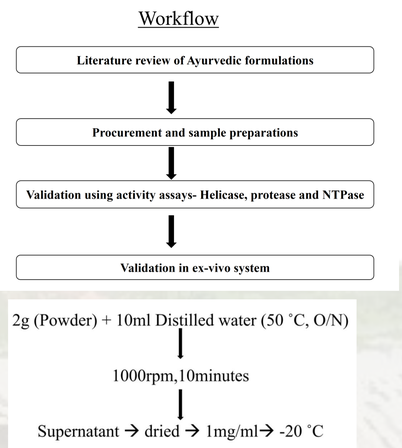
1. Cloning of nsP2 gene



3. Characterization of nsP2 protein



2. Expression of nsP2 protein



2g (Powder) + 10ml Distilled water (50 ˚C, O/N)
1000rpm,10minutes
Supernatant → dried → 1mg/ml→ -20 ˚C

Result

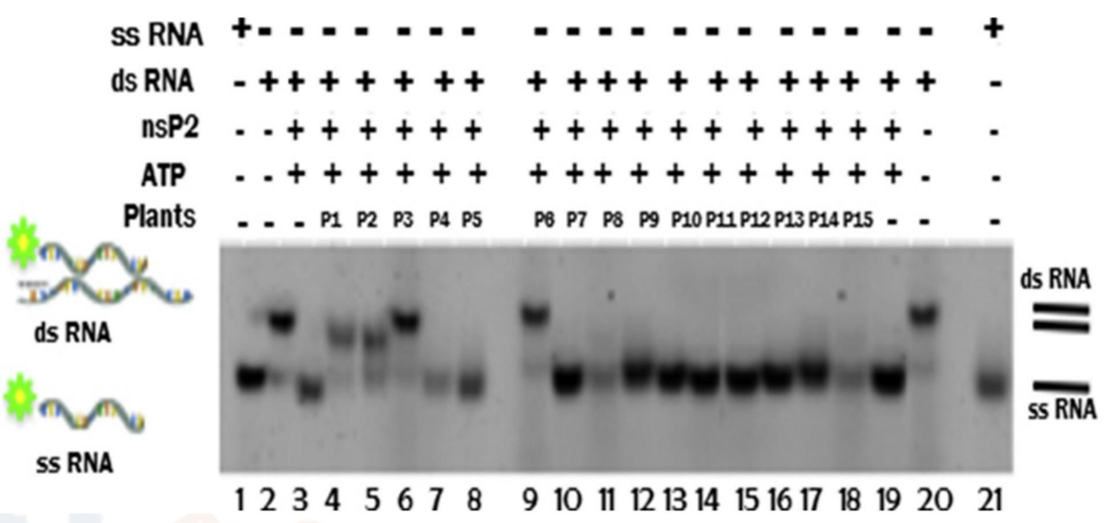


Fig. 1. Helicase activity assay. Lane 1 is single-stranded 30 bp oligonucleotide and Lane 2 is a fully duplex RNA of the 40 bp length with 10 base overhang. CHIKV nsP2 displayed unwinding activity in presence of ATP (Lane 3), which has been inhibited in presence of 10 µg of different plants P1, P2, P3 and P6 (Lane 4,5,6 and 9). The effect of plants alone has no effect on helicase activity.

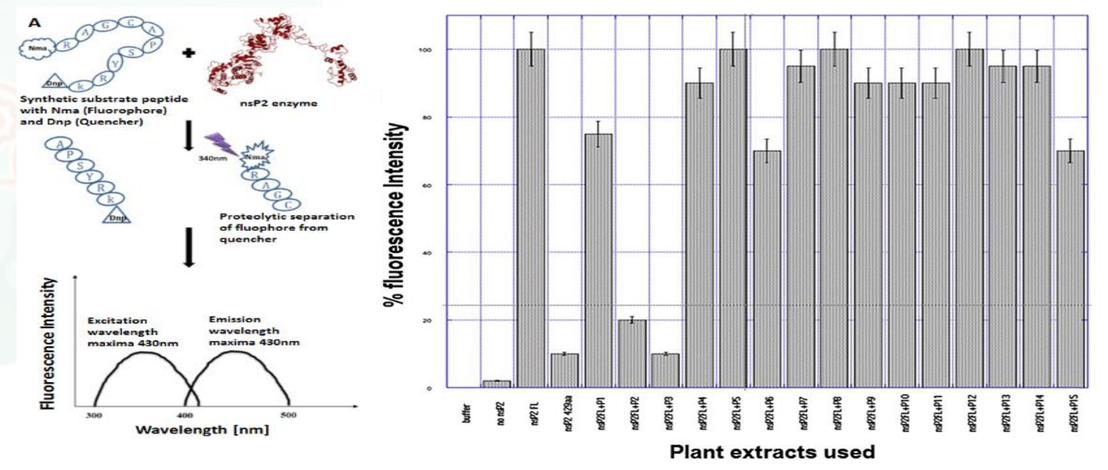


Fig. 2. Protease activity assay. FRET based protease Assay. The bar shows the fluorescence intensity with respect to Substrate and protease reaction. Bar 1, only buffer; Bar 2, without nsP2 protein; Bar3, with nsP2FL; Bar 4, with nsP2429aa; Bar 5–20, with nsp2 and different plants 1–15 respectively.

S·NO	Common name of Plant	Scientific Name	Part used	Plaque reduction assay	Helicase assay	Protease assay
1	Katuki	Picrorhiza kurroa	Rhizome	+	+	–
2	Shyama Tulasi	Ocimum tenuiflorum	Whole plant	+	+	+
3	Haritaki	Terminalia chebula	fruit	+	+	+
4	Giloi Guduchi	Tinospora cordifolia	stem	–	–	–
5	Salaki	Boswellia serrata	Resin	–	–	–
6	Sunti	Zingiber officinale	Rhizome	–	+	–
7	Amalaki	Phyllanthus emblica	Fruit	–	–	–
8	Guggulu	Commiphora wightii	RESIN	+	–	–
9	Haridra	Curcuma longa	Rhizome	–	–	–
10	Manjista	Rubia cordifolia	Stem	–	–	–
11	Nimba	Azadirachta indica	Bark	–	–	–
12	Rasna	Pluchea lanceolate	Whole plant	–	–	–
13	Nirgundi	Vitex negundo	Fruits, leaves	–	–	–
14	Salparni	Desmodium gangeticum	Whole plant	–	–	–
15	Devdaru	Cedrus deodara	bark	+	–	–

Table 1. Screening of plant extracts for anti-CHIKV activity.

Conclusions

1. **Katuki, Shyama Tulasi, Haritaki, Guggulu, Devdaru virus attachment inhibitors.**
2. **Katuki, Shyama Tulasi, Haritaki are attachment and replication inhibitors.**
3. **Sunti acted as replication inhibitor.**

Industrial Significance

1. Active ingredient identification
2. Pharmacophore modelling.
3. Development of potent molecules
4. IPR filing

Technology Readiness Level:

Can be used by general public as ayurvedic formulation
Industrial research required to harness the active moety and modifications.

References

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2.Singh, H. *et al.* Chikungunya virus inhibition by peptidomimetic inhibitors targeting virus-specific cysteine protease. *Biochimie* 149, 51–61 (2018)

3. Das, P. K., Merits, A. & Lulla, A. Functional cross-talk between distant domains of chikungunya virus non-structural protein 2 is decisive for its RNA-modulating activity. *J. Biol. Chem.* 289, 5635–53 (2014)

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