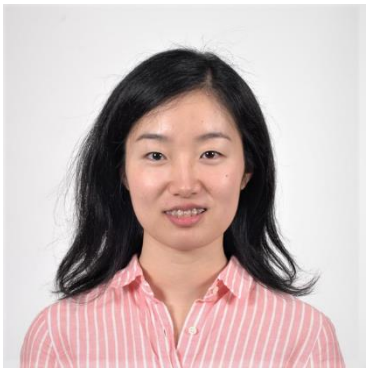
Best Poster Awardee – Doctoral Student Category



Xiaoyue "April" Chen received her BS degree in Biotechnology and MS in Biochemistry both at Nanjing Agricultural University in 2008, and 2010 separately. She started working towards her Ph.D degree in Instutute of Biologigal Chemistry at Washington State University since 2010 under Dr. David Gang's supervision. Her research interest lies in understanding biosynthesis and evolution of plant specialized metabolism. Her current focus is on biology and biosynthesis of salvinorin-related diterpenoids in the medicinal plant, *Salvia divinorum* (Diviner's Sage). Her recent publication (Journal of Experimental Botany, Vol. 68, No.5 pp. 1109, 2017) describes the identification and characterization of the enzyme that catalyzes the first step in the pathway of these interesting medicinal compounds.

Award Poster Title:

A (-)-kolavenyl diphosphate synthase catalyzes the first step of salvinorin A biosynthesis in *Salvia divinorum*

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Salvia divinorum (Lamiaceae) is a powerful hallucinogenic annual herb used by indigenous cultures of Mexico for medicinal and ritual purposes. It produces an array of bioactive neo-clerodane diterpenoids, with salvinorins A as the major accumulated products of the biosynthetic network. Salvinorin A is a highly selective kappa-opioid receptor agonist. This investigation aimed to identify the enzyme that catalyzes the first reaction of salvinorin A biosynthesis, the formation of (-)-kolavenyl diphosphate ((-)-KPP), which is subsequently dephosphorylated to afford (-)-kolavenol. Peltate glandular trichomes were identified as the major and perhaps exclusive site of salvinorin accumulation in *S. divinorum,* using detection approaches including MALDI-based imaging mass spectrometry (MALDI-IMS). The trichome-specific transcriptome was used to identify candidate diterpene synthases (diTPSs). *In vitro* and *in planta* characterization of a class II diTPS designated as SdKPS confirmed its activity as (-)-KPP synthase and its involvement in salvinorin A biosynthesis. Mutation of a phenylalanine into histidine in the active site of SdKPS completely converts the product from (-)-KPP into *ent*-copalyl diphosphate. Structural elements were identified that mediate the natural formation of the neo-clerodane backbone by this enzyme and suggest how SdKPS and other diTPSs may have evolved from *ent*-copalyl diphosphate synthase.